

# MODEL **Airplane** NEWS

**HUGE  
ISSUE!**

## Maximum Control

with digital servos *page 96*

## The Electric Jet Revolution 40 PRODUCT OVERVIEW

TOP FLITE'S  
Stinson Reliant



**MULTIPLEX  
COCKPIT**  
7-channel  
computer  
radio



December 2000 48120  
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**REVIEWS** • CERMARK Pitts S-2B • SR BATTERIES X250  
HITEC Sky Scooter • RC SHOWCASE 1.4 gas engine

**A**  
AirAGE



# MODEL Airplane NEWS

DECEMBER 2000 • VOLUME 128, NUMBER 12



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**ON THE COVER:** main image—this month's cover is dominated by the majestic Great Planes Stinson Reliant, photographed during a low-level flyby; insets—the lightweight, 7-channel Cockpit computer radio from Multiplex; Kyosho's new electric ducted-fan-powered Learjet—corporate aviation on a budget.

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## Research and recess

**W**hen our staff started researching electric ducted-fan (EDF) airplanes for the EDF kit guide in this issue, we were surprised by the sheer variety of kits now available. That diversity is part of the extraordinary growth in electric-flight technology, which seems to be picking up steam on all fronts. You can buy stock EDF airplane kits that will "loaf" around at an impressive 45mph or scream by at 75mph plus. And there's an EDF for every class of pilot. The "wow factor" in that future EDF project you build and fly depends only on your level of experience and ambition—see page 40.

Also in this issue is our annual "Holiday Wish List," in which we've rounded up a sampling of the very best products we've seen this year; and 2000 was a banner year for new, innovative RC products, from kits and ARFs to engines and accessories. Leaving the magazine open to this section—in a conspicuous spot in your home—will ensure that you don't receive any more socks and ties this holiday season!

One of the newest technologies to influence RC has been that of digital

servos. If you've ever wondered how digital servos differ from conventional ones, be sure to read Don Edberg's "Effective Programming" this month.



Graupner fan unit.

Don explains how these little powerhouses work, and what makes them perform so well.

Gerry Yarrish takes a close look at the RCS 140, a gas engine that—remarkably—has the look of a glow powerplant. How does this lightweight, relatively small gas engine perform? See what Gerry found out on page 84.

In the *Model Airplane News* office, it's a welcome break to go outside for "recess" and put some airplanes through their paces! Few products have made us smile the way Hitec's Sky Scooters have. We built and painted four of these models in the office, then walked across the parking lot to a ball field to fly them. Thanks to those little foam models, that was the best lunch hour we've had in quite a while! Because the Sky Scooter is a versatile design that suits beginners and experienced fliers, we even got a few of our coworkers from the art department in on the action. Anyone who wants to have a no-hassle, great flying time in his or her backyard should check out the photos from our "fly-in" and Bob Aberle's review of the Sky Scooter on page 66. ✦



Debra Sharp and Chris Chianelli "hard at work" with the Hitec Sky Scooters in a ball field outside the Model Airplane News offices. With a little paint, the models looked as good as they flew.

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## RC REMEMBRANCE

Here I sit, all dripping with nostalgia—and I don't think I'll ever get it off—as I read the short history of model aviation entitled "In Their Own Words" in the pages of the October 2000 issue of *Model Airplane News*.

When I was in high school, my drafting project was to make full-size drawings of one of Ben Shereshaw's designs. It was a big plane—8-foot span—and I powered it with a Gwinn Aero engine but never did find a space large enough to actually fly it.

How I love the names Kovel, Grant, Zaic, Bassett et al, for they were the heroes I grew up with and who inspired my model-building efforts. My most notable achievement was a fourth- or fifth-place win at a "Junior Birdman" stick-model free-flight contest.

Has anyone written a more definitive history of the sport? If so, I would like to purchase such a tome. If not, I would sign up to buy one.

Model building became a profound influence on my life. Through the Commercial Pilot Training Program, I became a flight instructor and learned the details of aerodynamics; to this day, I build and fly RC.

Thanks for the story; may there be more of them.

FRED E. BELLOWS  
Sharon, MA

*Fred, one of the most well-respected histories of airplane modeling, "Do You Speak Model Airplane," was written by David Thornburg. Available from the AMA, this well-written book is a definitive account of the Golden Age of aircraft modeling and comes highly recommended.*

DS

## PLANS TRANSFER

In reference to a letter from Dennis Wiles published in "Airwaves" in the October 2000 issue: I have found the most convenient method to transfer plan drawings to wood is through the use of a computer,

scanner, printer and freezer paper. Freezer paper, available in grocery stores, comes in rolls. Cut it so it fits into your printer. When you load the paper into the printer, be careful not to print to the waxed side! Place your plan in your scanner to copy the parts you want. You'll have to fold the plan, but don't worry; creases come out. Use the copy utility software that came with your scanner to copy the scanned drawing directly to the freezer paper. Cut out the freezer-paper patterns, leaving plenty of room around the outside for a good seal, then iron the patterns directly onto the wood. You can use either a covering iron or a regular clothes iron. Adjust the iron's temperature so the patterns peel off well without sticking but don't come off during cutting. Cut out the parts with a scroll saw or jigsaw, then peel off the freezer paper. An added feature of this method is that you won't mess up the plan with tracing marks or cuts; it's just as good when you've finished as it was when you began.

I suggest you do a test before you start with actual parts. Draw an accurate 6-inch square on a piece of paper, scan and copy it then measure the copy for dimensional accuracy. Your scanner may have minor inaccuracies; mine was off by 1.5 percent in horizontal, right on in vertical. This can be compensated for by adjusting the orientation of the plan in the scanner so that the inaccuracies of similar parts are in the same direction. I have just completed assembly of a B-17 with approximately 150 cut parts and have found this method better than anything I had previously used. [email]

BOB MUGGE

*Thanks for the tip, Bob. I'm going to the grocery store after work today to pick up a roll of freezer paper to try this out. Computers, scanners and printers have become everyday tools that make our lives easier, and they are certainly very convenient for scratch-builders.*

GY

## AN ENGINE STORY

On page 55 of the October 2000 "Grassroots" column, there's a photo of a very nice Gypsy Moth by Ray Williams.

The caption mentions that the engine used was a design by "Merritt Zimmb." There is a lot more behind that engine than you might be aware of.

First of all, the correct name of the engine designer is Merritt Zimmerman. Except for the chroming of the cylinder walls, he completely manufactured and assembled that engine in his basement shop. I happen to have been in his shop years ago, and I have seen these engines in various stages of assembly. Mr. Zimmerman also made the engine in two scale sizes. He was a member of the Westlake RC club outside Cleveland, OH, along with my dad, Frank Hoffer. Probably about 20 years ago, Mr. Zimmerman decided to build a scale Moth, and that is when he decided that none of the commercially available engines would meet his standards; hence, he designed his own.



The photo shows Mr. Zimmerman's Moth at the Toledo show, along with both sizes of engine he designed and built. It is a very fine scale model, and yes, the wings fold back along the body just like the real thing! Mr. Zimmerman's Moth was sold to a Japanese modeler a few years later, and I like to think that it graces the skies around Tokyo to this day. Mr. Zimmerman later sold the rights to manufacture his engines to a British firm, but I wasn't able to find the company's name in my files; I hope the engines are still being produced.

I inherited one of these fine engines from my father; someday, I may have to build a Moth for it, too.

DENNIS HOFFER  
Olney, MD

*Dennis, thank you for sharing Mr. Zimmerman's story with us. If you ever do build a Gypsy Moth for the engine you have, please be sure to send us a photo.*

DS ♣



**New products or people behind the scenes;** my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you the reader who matters most! I spy for those who fly!

**AIR SCOOP**  
BY CHRIS CHIANELLI



# Classic

## AMERICAN WARHORSE

**K**oyosho's Super Quality Series warbirds certainly live up to the name, and we expect the new P-51D Mustang ARF to be no exception. This .40-size semi-scale model comes almost fully assembled, and it is covered in realistically printed film. The kit includes many accessories: wheels, engine mount, fuel tank, linkages and pre-painted cowl. The kit provides fixed gear but will easily accept retracts. The Mustang spans 54.7 inches, weighs approximately 5.7 pounds flight-ready and requires a .40 to .46 2-stroke and a 4-channel radio (5, if you use retracts).

Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826; (800) 682-8948; fax (217) 398-0008; [www.greatplanes.com](http://www.greatplanes.com).



## A HELPING HAND FROM Hitec

**T**he backbone of the model aviation hobby is formed by the many RC flying clubs out there. The key to keeping the hobby healthy and growing is to support these clubs and make sure that model aviators always have a place to fly. Hitec realizes this and has started a great new program designed to help cover the expense of maintaining and improving flying fields. Here's how to participate:

**Hitec Field Improvement Fund**  
Hitec RCD Inc. announces the establishment of a field-improvement fund to help RC flying clubs improve existing flying fields. Any club can apply to Hitec RCD Inc. with a plan that must include the following verifiable information.

- Contact name, address and phone number.
- The same data for three members of the club's board of directors.
- Number of dues-paying club members.
- A brief description of proposed improvements.
- Whether the field is club-owned or leased, and if leased, how much longer lease has to run.

In addition to the above information, supply a statement in 100 words or less, "from the heart," that defines why your club should receive money from this fund.

Ten \$1,000 awards will be given.

Entries must be post-marked before February 1, 2001; awards will be disbursed by April 1, 2001.

Send entries to  
Hitec RCD Inc.  
Field Fund  
12115 Paine St.  
Poway, CA 92064

## Engine with a Brain

**I**f high-tech, high-performance models are your thing, O.S. has your engine: the 1.40 RX-EFI. You guessed it: that "EFI" tacked on to the name stands for "electronic fuel injection." And that means precise fuel metering—something you just can't get with a carburetor. The heart of the system is the EC-1 electronic control unit; it measures the engine conditions via two sensors and calculates the fuel required to yield optimum performance at any rpm. The result is an engine that is smooth and powerful, regardless of throttle position or rpm. You might think that the fuel-injection hardware would make this engine heavy. Not so; the 140 RX-EFI weighs just 28.5 ounces. Peak power is 3.5hp at 9,000rpm, but the real advantage of EFI is the midrange and part-throttle power.

Great Planes Model Distributors Co., P.O. Box 9021, Champaign, IL 61826; (800) 682-8948; fax (217) 398-0008; [www.greatplanes.com](http://www.greatplanes.com).



## Where Eagles Dare

**H**irobo is looking to set the standard for aerobatic .60-size helicopters with its SST Eagle Freya .60, distributed by Altech Marketing. Two F3C World Championships and two decades of helicopter manufacturing experience have contributed to the design. The Freya incorporates many features sought after by heli pilots: a triple-bearing tail-rotor assembly, a precise, discrete tail-pitch mechanism and a constant-drive tail rotor for aerobatic control during autorotation. The controls are the push/pull cyclic type and have a wide range of input for any level of aerobatics, and all of the drive-train and lever-arm components feature ball bearings. Best of all, expect a street price of less than \$700.

Altech  
Marketing,  
P.O. Box  
6312, Edison,  
NJ 08818;  
(732) 225-  
2100.





## Cutting Edge

Hot off the wire comes word of the new Edge 540 ARF from Horizon Hobby. Details are sketchy so far, but what we do know sounds good. This unlimited 3D/freestyle aerobat is designed by seven-time TOC competitor Mike McConville and is IMAA- and IMAC-legal. The 540 is 90-percent prebuilt, covered in Goldberg Ultracote and comes with painted fiberglass cowl and wheel pants. The kit includes complete hardware from Du-Bro, Sullivan and Hangar 9. This plane has the proper credentials; we can't wait to see it in action.

Horizon Hobby Inc., 4105 Fieldstone Rd., Champaign, IL 61822; (217) 355-9511; [www.horizonhobby.com](http://www.horizonhobby.com).



## PIQUE YOUR CURIOSITY

Northeast Sailplane offers several great backyard electrics, and its new Pique fits right in. The 41-inch-span wings plug into the fuselage for easy transportation and assembly. The wings are built-up wood and film, and the fuselage is rugged plastic, so no covering is required. The Pique comes with a lot of little extras that make it stand out; landing gear and multi-colored wheels, trimmed windshield, painted pilot and decals are all included. Northeast Sailplane offers the flight packs and accessories you will need to get flying, or you can buy them in a package with the plane and save a few bucks.

Northeast Sailplane Products, 948 Hercules Dr., Ste. 12, Colchester, VT 05446; (802) 655-7700; [www.nesail.com](http://www.nesail.com).

## Keep the Neighbors Happy

The growth of both population and commerce means that secluded flying fields are increasingly scarce, so noise considerations have become more important than ever, whether it's keeping down engine noise at your local or club field or keeping within competition regulations. B&K Precision's Digital Sound Level Meter provides an accurate and affordable means of measuring sound levels in the field. This hand-held, battery-powered unit can measure from 30 to 130dB with an accuracy of  $\pm 1.5$ dB. The unit features a four-digit LCD with a 0.1dB resolution, a 0.5-second update cycle and a frequency range of 31.5Hz to 8kHz. Dimensions (LxWxH) are 275x64x30mm, and it weighs 6.5 ounces with battery.

B&K Precision Corp., 1031 Segovia Cir., Placentia, CA 92870; (714) 237-9220; fax (714) 237-9214; [www.bkprecision.com](http://www.bkprecision.com).



## First-Time Flyer



Easy to build, easy to fly; that is the basis for any good, entry-level trainer. Global's RCM Trainer 40 is a perfect example of this philosophy; it requires no glues or special tools to build. Global calls this "screwdriver assembly" and claims that even beginners can have it together in under two hours. Beginners may make a few rough landings while learning, so Global included dual aluminum spar blades and a robust landing gear to ensure that the Trainer 40 will last. Flat-bottom wings with 708 square inches of surface area provide a slow stall speed and stable, predictable flight characteristics. The engine mounts are factory-drilled, and blind nuts have been installed; the pattern fits Magnum 40 or 46 bolt patterns, as well as many other standard engines, so no drilling is necessary.

Global Hobby Distributors, 18480 Bandelier Cir., Fountain Valley, CA 92708; (800) 854-8471; [www.hobbypeople.net](http://www.hobbypeople.net).



# Give a Pilot some Lift

Artist and modeler Rick Brown has come out with just the thing to give a fellow flier's attitude some altitude. "Hobby Hoots" is a line of 10 greeting cards cre-



ated specifically with the model aviator in mind. Whether it's a special occasion, a get-well wish, or just an excuse to say "Hi," Hobby Hoots has a funny way of delivering a message that highlights the hobby we all love. With these cards, Rick provides a personalized way to reach out to a modeler while reminding us not to take the hobby—or ourselves—too seriously. And—according to Rick—if nothing else, they're great to mix epoxy on!

Hobby Hoots, P.O. Box 341, Furlong, PA 18925; (215) 794-8186.



# Mud Crickit?

This is the Crickit from Mud Duck Aviation—a .15-size sport plane that is all about fun. Small enough to fly in parks, backyards and other tight spaces, the Crickit can be built for novice or experienced pilots. The standard configuration makes an aerobatic little flyer, while the beginner option reduces control-throw sensitivity for a more docile feel. The kit is made out of laser-cut wood and die-cut Fome-Cor board that can be painted but requires no covering. Wheels, landing gear, full graphics and an instruction booklet round out the package and make this an easy-to-build, fun-to-fly, go-anywhere little fun machine.

Mud Duck Aviation, Flying Frog Farm, 5380 Providence Ln., Sumerduck, VA 22742.



# Backpack-Powered Parachute

Here's an innovative model that offers something different for the RC pilot. Airfoil Aviation Inc. designed this powered parachute to be simple and fun; it uses a .15-size engine and a 2-channel radio. The 55-inch parachute provides enough lift for slow flight, so it can be flown anywhere. When you're ready to land, just kill the engine, and it glides down using the 'chute—descent is slow enough to catch it out of the air! The kit even comes with the figure, and you can order the complete system with radio and engine.

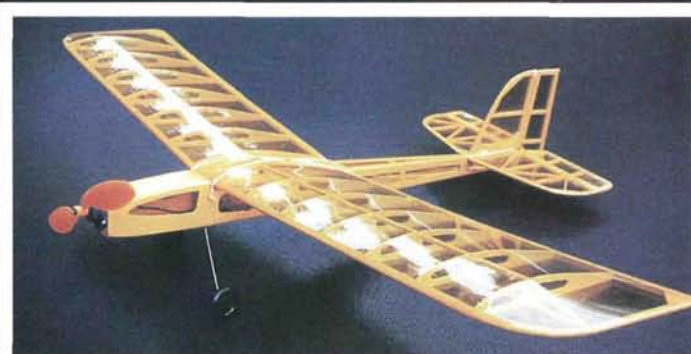
AirFoil Aviation Inc., R.R. 1, Box 180B, Loraine, IL 62349; (217) 938-4373.



# No-Fuss Micro-Fun

The Micro-Lite ARF from Marky's Hobby Shop was designed specifically for novice fliers; the concept was to build a hassle-free plane that a beginner could pick up and fly all day. Its 36-inch wingspan allows tight turns and agile maneuvering, but Marky's assures us it remains among the most neutral flying micro-planes available. The Micro-Lite will fly for from 7 to 9 minutes on a 5- or 6-cell 350mAh battery pack, which should be plenty for a beginner. The kit includes a 260 motor, gear drive and 8-inch GWS prop, and it retails for \$109.95.

Marky's Hobby Shop, 208 Maplewood Ave., Oakhurst, NJ 07755; (732) 539-8002; [www.parkflyers.com](http://www.parkflyers.com). ✈





# HINTS & KINKS

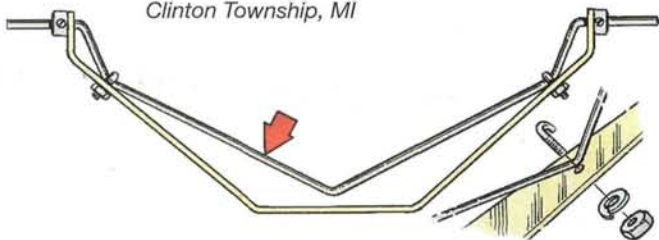
BY JIM NEWMAN

**SEND IN YOUR IDEAS.** *Model Airplane News* will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman, c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.

## A BASHABLE GEAR

You can strengthen aluminum landing gear for rough-field flying by drilling it as shown and then attaching a wire reinforcement with locking washers, nuts and J bolts. Be sure the apex of the wire does not vibrate against the aluminum, or it may cause radio interference.

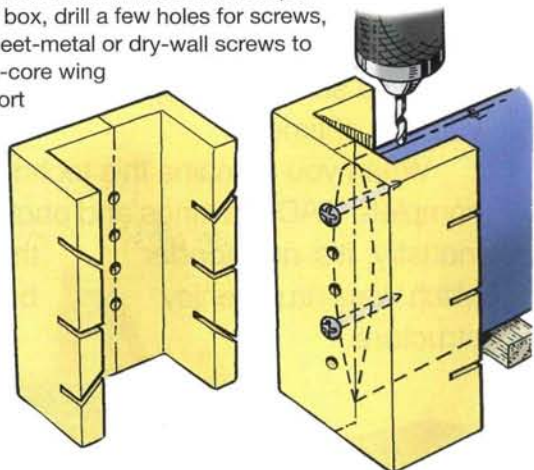
John Sarakun,  
Clinton Township, MI



## ACCURATE DRILLING

This jig ensures accuracy when drilling the leading edge for dowels. Mark centerlines on an inexpensive plastic miter box, drill a few holes for screws, then use large sheet-metal or dry-wall screws to attach your foam-core wing to the box. Support the wing trailing edge on shim blocks, then use a drill press to carefully drill dowel holes on the leading-edge centerline.

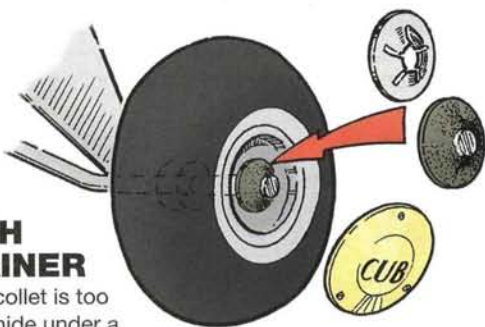
Jackie Tse,  
Markham,  
Ontario, Canada



## FLUSH RETAINER

A wheel collet is too bulky to hide under a wheel hub cover. Use a spring-retainer washer from a hardware store to hold the wheel in place while you apply a fillet of JB Weld over it. This is an immensely strong retainer.

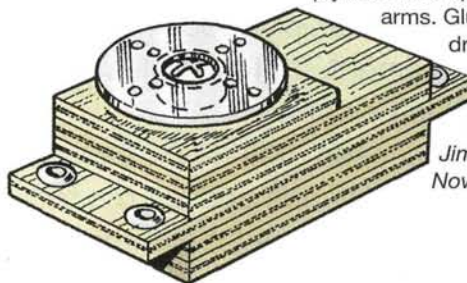
Bobby Patterson, Point Pleasant, WV



## SERVOS FOR DUMMIES

Make a couple of dummy servos of various sizes out of scrap plywood and spare servo wheels or arms. Glue in metal eyelets as drill bushings. These dummies are very useful when planning installations.

Jim Taylor, Coldbrook,  
Nova Scotia, Canada



## HOT TOPIC

The knobs of older covering-film sealing irons can become uncomfortably hot. A couple of O-rings from the hardware store pushed over the knob will insulate your fingers from the heat. A plywood ring will also work.

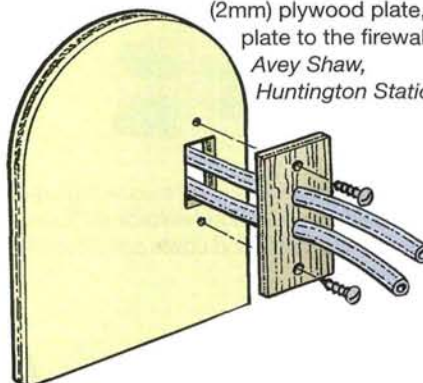
Frans Sant, Haarlem,  
The Netherlands



## AN EASY PASSAGE

To ease the passage of fuel lines, cut a large access hole through the firewall, then bring the lines through on a 1/16-inch (2mm) plywood plate, and attach the plate to the firewall with screws.

Avey Shaw,  
Huntington Station, NY

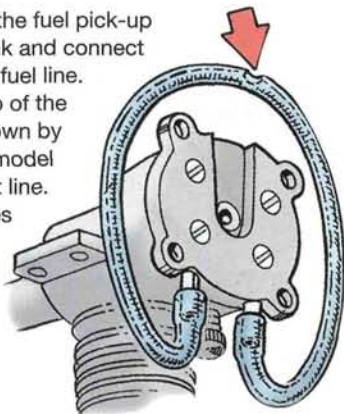




## INVERTED COX

Remove your fuel tank and rotate the fuel pick-up tube 180 degrees. Replace the tank and connect the two vent tubes with a piece of fuel line. Snip or melt a small hole in the top of the fuel tubing to create a vent, as shown by the arrow. Refuel by inverting the model and pulling off one side of the vent line. This will also work on other engines with tank mounts.

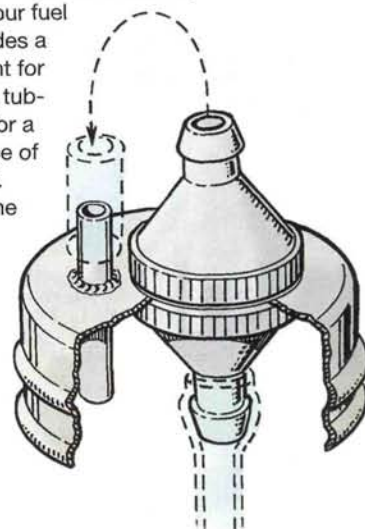
Ernie Hamburg, Reno, NV



## FILTER TIP

Drill a hole in the cap of your fuel can and install a filter, as shown. The filter not only keeps debris out of your fuel tank, but it also provides a convenient attachment for the can's fuel pick-up tubing. Solder in a tube for a vent, then slide a piece of fuel line over the tube. Now you can reseal the can after fueling by plugging the fueling hose into the vent tube, shown by dashed line.

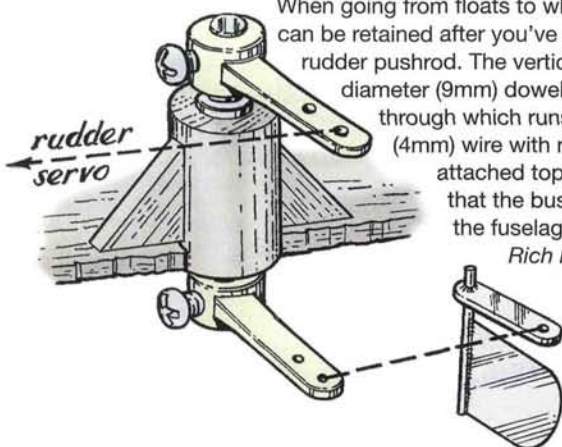
Mervyn Matthews,  
Palmerston North,  
New Zealand



## WET TO DRY

When going from floats to wheels, the steering gear can be retained after you've disconnected the water-rudder pushrod. The vertical bearing is a  $\frac{3}{8}$ -inch-diameter (9mm) dowel bushed with a Nyrod, through which runs  $\frac{5}{32}$ -inch-diameter (4mm) wire with nosewheel steering arms attached top and bottom. Be sure that the bushing is well braced to the fuselage bottom.

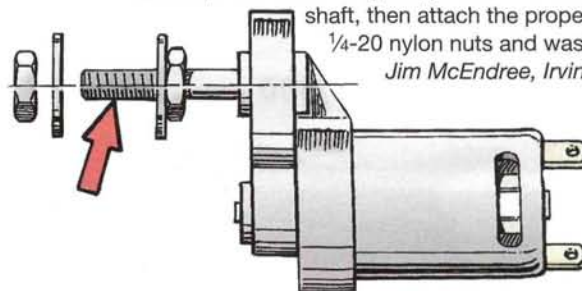
Rich Moreau, Lake Station, IN



## PROP-ER RETAINER

Several aftermarket add-on gearbox manufacturers recommend that you glue the propeller to the shaft. Instead, with a threading die, put a  $\frac{1}{4}$ -20 thread on the shaft, then attach the propeller with  $\frac{1}{4}$ -20 nylon nuts and washers.

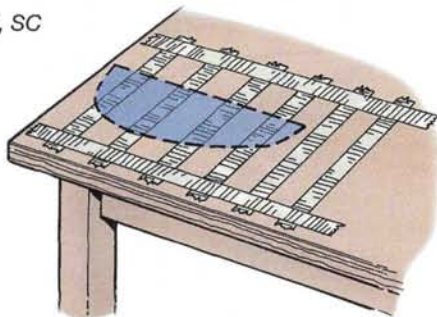
Jim McEndree, Irving, TX



## TACKY TABLE

Before you cover small parts such as control surfaces, apply double-sided adhesive tape to your bench. Set the small components on the tape; it will hold them securely, and your hands will be free to pull on the covering film as you apply the sealing iron.

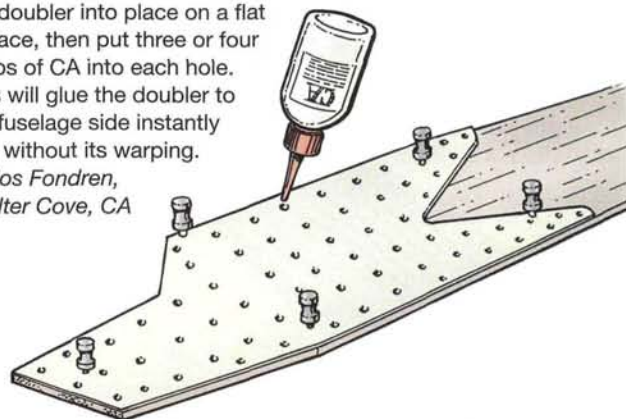
Don Baker, Aiken, SC



## NO-WARP DOUBLER

Before gluing the fuselage side doubler into place, drill several  $\frac{5}{32}$ -inch (4mm) holes, as shown. Pin the doubler into place on a flat surface, then put three or four drops of CA into each hole. This will glue the doubler to the fuselage side instantly and without its warping.

Carlos Fondren,  
Shelter Cove, CA





# PILOT PROJECTS

*A look at what our readers are doing*



## SLOW BUT DEADLY

This flight shot of John Niezelski's 100-inch-span Douglas Dauntless SBD-3 could be passed off as a photograph of the full-size plane! The model is a testament to John's scratch-building skills, and it flies with the help of a Zenoah Z-445. It boasts such scale details as retracts, dive brakes, flaps, bomb drops and a complete cockpit. Nick Zirolì designed the plan for this model.



## SHOW-STEALING SUKHOI

Steve Camp didn't need to tell us that his slightly larger than 1/4-scale Byron Sukhoi is a striking aircraft. The plane, dressed up in black

lacquer with Scale Model Graphics decals and with a B&B Smoke System, must really turn heads at the flying field in Independence, MO. A J&A 4.2 Sachs engine and a Power Purr muffler provide the thrust, while stall strips and counterbalanced control surfaces keep the model flying straight. The finishing touch is a pilot figure that bears an uncanny resemblance to Steve himself!

## STARRED & STRIPED BIPE

This clean-looking Goldberg Ultimate Bipe is the handiwork of master builder Wendel Roberts. Owner Stan McDaniel says that Mr. Roberts has built many excellent models for him. Both RC'ers live in Little Rock, AR, where this patriotic biplane screams through the sky powered by a YS 1.20 engine.



## SEND IN YOUR SNAPSHOTS.

*Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.



## VINTAGE GRACE

John P. Radebaugh's 1/4-scale 1912 Blackburn Monoplane is accurate down to the last rivet and flying wire. Powered by a .90-size 4-stroke engine, the 96-inch-span D.B. Sport Scale kit flies as a vintage scale aeroplane should: slowly. The plane was built to compete at the U.S. Scale Masters in Team and will be piloted by Don Harris of Bandon, OR.



## MEASURING UP

It comes as no surprise that after building an RC aircraft out of 40 yardsticks, Robert Joseph named it the "Yard-Bird." This 10-foot-span plane shows off Robert's ingenuity with clear MonoKote covering the fuselage. An MDS .68 engine powers the plane, and Robert tells us that he will be adding wheel pants and a smoke system to his Bird in the near future.





## CESSNA OBSESSION

This prize-winning Cessna L-19 Bird Dog model was built by Ken Nottestad of Fenton, MO. Power comes

from an O.S. .91 FS, and the 72-inch-span plane is covered in Ultracote that has been spray-painted to achieve the desired paint scheme. The innumerable details include a cockpit equipped with throttles, wheel, radio, map lamps and an instrument panel, among other scale accouterments. The scale pilot figure is an old 12-inch-tall GI Joe figurine strapped to the seat

with a functional seatbelt.



## REGAL RHODE ISLANDER

This cloth-covered Junkers J-10 model was scratch-built over three months by Bob Farmanian. The 1/6-scale beauty storms the flying fields of North Kingstown, RI, with a Zenoah G-38 engine spinning an 18x10 prop. What are the flight characteristics of an 87-inch-span J-10? Bob puts it simply: "Flies great."

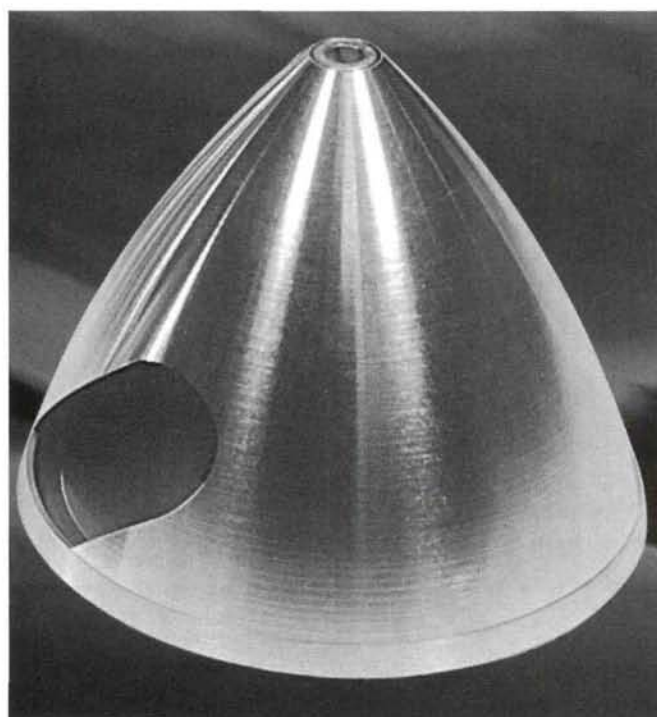


## TOP-NOTCH TEXAN

Aldo Mastice of Neuquen, Argentina, built this pretty AT-6 Texan from a Midwest

1/6-scale kit. The Texan has an 83-inch wingspan and weighs 12 pounds. It's powered by a Webra 1.20 engine and features Robart retracts. We're told the model is stable, quick and aerobatic in flight.

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## STRIKING THUNDERBOLT

This modified Hobby Hangar P-47 was constructed and thoroughly detailed by Mark Rittinger of Lenox, MI. With a 40-inch wingspan and powered by an O.S. Max .25, the Thunderbolt weighs in at only 2½ pounds. Mark covered his plane in chrome MonoKote and installed Hobbico retracts and functional bomb drops to achieve a stunningly scale-looking plane.



## FLYING TIGER

This Carl Goldberg

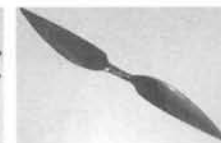
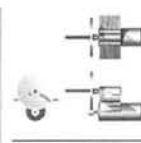
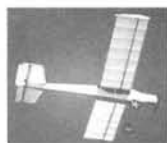
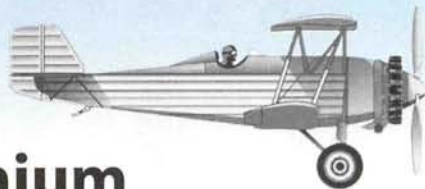
Extra 300 comes to us from Todd Thomasson of Danville, VA; an avid young modeler. An O.S. 1.08 engine with a Pitts muffler powers the plane. Even more impressive than Todd's plane's tiger markings is his active role in his local flying club. Even though he's only 16 years old, Todd has already helped to plan two giant-scale fly ins and an IMAA Big Bird fly in, taught a class on model airplane building and taught four people how to fly! Young modelers like Todd are crucial to the future of RC flying. Keep it up, Todd! ✈

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- WES Technik **Carbon Fiber Prop**, 23 cm (9").

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# Holiday WISH LIST

The holiday season is here again: time to make up that wish list of all the cool modeling products you've lusted after during the past year. We here at *Model Airplane News* get to see a lot of the great new products up close, so we've put together a list of our favorites. All of it is stuff we've seen and tried, and each item on this list has been chosen by our editors as the best on the market. This is the stuff we want to see under our tree! So grab a pen and start circling the items you can't go another flying season without, then leave this page open on the coffee table and see if Santa catches the hint.

## SCALE

### DE HAVILLAND DE LIGHT

Any of Kyosho's Super Quality Series ARFs is good for a healthy dose of holiday cheer, but we especially like the de Havilland DH82 Tiger Moth. The detail on this model is fabulous; its all balsa fuselage and wings are precovered in cloth-processed film with authentic textures. Wheels, linkages, engine mount and fuel tank are all included with this 54-inch-wingspan beauty at a street price of around \$250. Hook up your favorite .40 to .46 2-stroke or .48 to .53 4-stroke and enjoy the holiday cheer. Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).



### FOR THOSE WHO'VE BEEN EXTRA NICE

With a wingspan of 100.5 inches, this Great Planes Extra 330L is big enough to carry Santa and all his reindeer on their appointed rounds! Features such as all-wood construction, interlocking parts and tube-mounted wing and stab make it sturdy enough to handle those rooftop landings, too. At around \$400 (street price) for the kit, Santa won't have to trade in the sleigh to afford it, either. If the elves can come up with a 3.2 to 5.25ci (50 to 85cc) 2- or 4-stroke gas or glow engine, then all that will be missing is a bright red nose! Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).



### TICKET TO YESTERYEAR

The Ford Flivver by Dymond is just the thing for those looking for a slow aerobatic ARF with vintage style. The Flivver comes in two color schemes (blue/silver and red/silver) and in two sizes (52- and 72-inch wingspan). The model is easy to assemble; the wings are one panel, and the surfaces are prehinged. The Flivver comes with landing gear and tailwheel and is ready for either gas or electric power. The 52-inch Flivver costs \$149, and the 72-inch kit is just \$189. Dymond Model Sport USA Ltd., (920) 303-1100, [www.rc-dymond.com](http://www.rc-dymond.com).

## SPORT



### BACKYARD STOCKING STUFFER

No plane can be everything to everyone, but Norvel's UCAN-2 is about as close as it gets. Affordable? Try \$114.99 including the B6R BigMig .061 engine! Easy to build? It's 90-percent prebuilt and 100-percent covered. Easy to fly? With a wingspan of 41 inches, a wing area of 265 square inches and a weight of just 24 ounces, this plane is docile at slow speeds yet nimble enough for full aerobatics. If you want a plane that is comfortable in many roles, the Norvel UCAN-2 is a great choice at a great price. Norvel, (800) 665-9575, [www.norvel.com](http://www.norvel.com).



### NICE AND EZ

Altec Marketing has brought back the sorely missed EZ line of ARFs to the U.S. market with its CAP 3D. The EZ kits are known for their high quality, unparalleled graphics and ease of assembly; the CAP adds excellent flight characteristics to the list of accolades. The CAP spans 61.8 inches and features factory-installed aileron hinges, metal engine mount and drilled mount locations. Add your favorite .40 to .50 2-stroke or .70 to .80 4-stroke, and experience what put the EZ series at the forefront of the ARF revolution in the '80s; \$340 (street price). Altec Marketing, (732) 225-6144, [www.modelrec.com](http://www.modelrec.com).

### PUT A TRAINER UNDER YOUR TREE

Here is the perfect gift for all those aspiring fliers out there: the Hangar 9 Xtra Easy. This ready-to-fly trainer is a great first plane. It includes everything you need to be ready for takeoff in less than an hour, from engine to batteries to wheels. Best of all, it includes JR's XF421EX computer radio—unheard of in an RTF! This is a great package and a real bargain at around \$380, and once you've mastered the basics, available options can keep the fun going: a sailplane launch, an aerial camera mount and a drop chute can be added. Horizon Hobby Distributors, (217) 355-9511, [www.horizonhobby.com](http://www.horizonhobby.com).







## YULETIDE IN YELLOW

Yellow Aircraft has joined the ARF ranks, which is good news for pilots with precious little free time around the holidays. Among our favorites is the Sukhoi SU-31M, available in .60 and 1.20 sizes. Both feature balsa-and-ply construction covered in MonoKote and come with painted cowl and landing gear, hardware, spinner, vacuum-formed canopy and decals. At just \$249 for the .60-size plane or \$379 for the 1.20, these models will leave room in the budget for more "Holiday Wish List" goodies. Yellow Aircraft, (781) 674-9898, [www.yellowaircraft.com](http://www.yellowaircraft.com).



## GIANT-SCALE ARF FOR GIANT-SIZE FUN

ARFs make great gifts, especially considering the number of beautiful kits that have recently taken the market by storm. Last year, we gushed over Hangar 9's PT-19, and this season, it has done us one better—and bigger—with its 1/4-scale J-3 Piper Cub ARF. The craftsmanship on this Cub is exceptional; it is 90 percent prebuilt and covered in Worldtex fabric (not film). The wingspan is more than 100 inches, so this gentle giant is IMAA-legal and the price is right at \$379.95. Hangar 9 designed the Cub with the Zenoah G-23 gas engine (\$289.95) in mind, and we like the performance, value and economy that this combo offers. Horizon Hobby Distributors, (217) 355-9511, [www.horizonhobby.com](http://www.horizonhobby.com).



## STOCKING CAP

What better way to ring in the holidays than with Lanier's new CAP 232 ARF? Lanier maintains its tradition of high quality at reasonable prices while bringing you the latest in state-of-the-art ARF technology. The CAP (\$229.99) features plug-in, balsa-sheeted, foam-core wings and airfoil-shaped tail surfaces and painted fiberglass cowl and wheel pants. Covered in three colors of Ultracote, the CAP will look great under your tree and in the air. Lanier RC, (770) 532-6401, [www.lanierrc.com](http://www.lanierrc.com).



## CHRISTMAS KITTEN

For the person who has everything—except one of the most beautiful turbine warbirds we've ever seen—here is CAI's F9F-5 Panther, a breathtaking example of what can be accomplished in a no-compromises, highly prefab kit. From its molded-composite Kevlar, Nomex and carbon-fiber airframe to its factory-assembled, retracting gear with scale wheel-and-disc-brake set, everything about this kit is well-designed and beautifully rendered. Flight-ready, it weighs 36 to 38 pounds and requires 28- to 30-pound turbines. Sure, it costs \$6,500; but what do you expect for the best? Crow Aviation Inc., (225) 214-1090, [www.crowaviation.com](http://www.crowaviation.com).

## BUILD SOME FUN FOR 2001

The SlowPoke Sport 40 kit from Great Planes makes a great gift for first-time low-wing fliers. The wingspan on this vintage-looking sport plane is just 50 inches, but its huge wing area (1,076 square inches) and low wing loading make this plane exceptionally stable at slow speeds. The SlowPoke comes with ailerons for exciting aerobatics and is very affordable at just \$109.99. Great Planes can also provide you with the perfect powerplant; we like the O.S. .52 for the SlowPoke, but with that much power, no one will call it "slow." Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).



## BLUE CHRISTMAS

Global's Blue Max sport-plane ARF is all about fun: fun to build and really fun to fly. The kit comes 90 percent covered in transparent orange, maximizing in-flight visibility while allowing the intricate truss work to show through. The Blue Max's flight characteristics are excellent with its flat-bottom airfoil; it is aerobatic yet very stable and virtually stall-proof. The kit sells for \$189.99, which is a steal when you consider that the handmade, 5-inch, metal-spoke wheels cost from \$40 to \$50 on their own. Throw in a potent little Magnum .52, also from Global, and you have a recipe for holiday fun all year round. Global Hobby Distributors, (714) 964-0827, [www.globalhobby.com](http://www.globalhobby.com).

## SENSATIONAL GIFT

The Sensation 1400 ARF from Kyosho is a great way for sport fliers to live out their fantasies of being famous aerobatic pilots. The Sensation was designed by world-renowned aerobatics champion Hanno Prettnner—who knows a little bit about flight performance! The 55-inch-wingspan Sensation comes brightly covered with matching cowl and wheel pants, and it comes with a stocking full of hardware at a street price of around

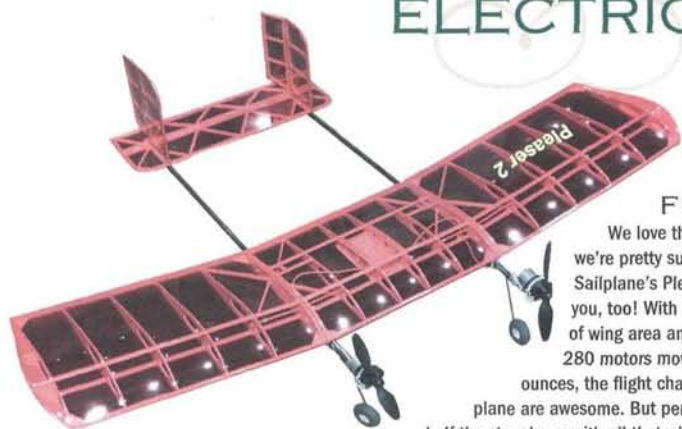
\$250. All you need is an engine—the Tower .46 (also from Great Planes) would make an excellent choice. Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).





# HOLIDAY WISH LIST

## ELECTRIC



### FUN X 2

We love this park flyer, and we're pretty sure Northeast Sailplane's Pleaser 2 will please you, too! With 400 square inches of wing area and two Multiplex 280 motors moving just 15 ounces, the flight characteristics of this plane are awesome. But performance is only half the story here; with all that wing, the plane will

fly at a walking pace or thermal with ease. The plane is mostly prebuilt and is easy to get flying, so it makes a fine gift for novice modelers. The plane costs \$129.95, or you can order the entire package (which includes the radio and all the electronics, battery packs and chargers) for \$369.95. Northeast Sailplane Products, (802) 655-7700, [www.nesail.com](http://www.nesail.com).

### SCHOOLYARD SCOURGE

Hobby Lobby takes park flyers to a whole new level with the Eindecker. It takes off quickly, turns promptly, can handle light wind and can be flown in restricted areas. The carbon-reinforced foam wing spans 50 inches, but the Eindecker weighs only 11 ounces flight-ready. You can buy the



Eindecker kit for \$59, or you can buy a complete package that includes the plane, radio, motor, gearbox and prop, controller, battery pack, charger and connectors for \$299. Hobby Lobby Intl., (615) 373-1444, [www.hobby-lobby.com](http://www.hobby-lobby.com).



### BACKYARD BIPE

Herr Engineering is well-known for its precision engineering, and the 1/2A scale Pitts Special is a fine example of the company's commitment to high quality. And at \$79.99, it is a real value, too; computer-designed and laser-cut parts ensure that the Pitts is easily assembled and handles well. The wingspan on this little aerobat is 30 inches, and it weighs just 27 ounces. With those dimensions, the recommended .061 to .074 engine will really make this plane exciting. Herr Engineering Corp., (407) 264-2488, [www.iflyherr.com](http://www.iflyherr.com).



### FOR THE CORPORATE FLIER

Kyosho has the perfect gift for pilots who have been "Lear-y" of ducted-fan models. The Lear jet ARF's flight characteristics are nothing short of spectacular—very nimble and extremely responsive. The Lear has a 57.5-inch wingspan and features tough, styrene foam construction covered in a glossy white coat. This plane is so much fun that those former doubters will wonder why they didn't jump on the fan-wagon sooner! \$399.99. Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).

## ENGINES

### POWER INTO THE NEW MILLENNIUM

The 6.4 Millennium Twin from Brison Aircraft has been so well received that its growing popularity surprised even the people at Brison. But considering what a superb design it is, nobody should be surprised that the 6.4ci (104cc) twin is winning fans and competitions both. Designed with 35-percent aerobatic planes in mind, the twin weighs just 6 pounds and belts out 9.4 bhp. Standard features include Nikasil-lined cylinders and a blue-anodized finish for \$1,199, and the twin can be fitted with optional electronic ignition and the Bisson mufflers shown. Brison Aircraft, (972) 241-9152, [www.brisonaircraft.com](http://www.brisonaircraft.com).



### DREAMING OF A PURPLE CHRISTMAS

Finding the Thunder Tiger GP-07 under the tree is guaranteed to make "your days be merry and bright." This purple-anodized dynamo cranks out 0.19 bhp at 17,000rpm—more than enough for that small project you have in your shop. It features an ABN piston and cylinder for durability and bronze bearings for maintenance-free operation. Also included are an air-bleed carburetor and a bolt-on muffler, and the swept-back needle valve makes adjustments easy and safe. The GP-07 is available from Ace Hobby Distributors for just \$49.99. Ace Hobby Distributors, (800) 322-7121, [www.acehobby.com](http://www.acehobby.com).



### BIG POWER FOR BIG FUN

You can never have too much power in a big scale or sport aircraft, but power used to come with a penalty: weight and bulk. O.S. is changing the rules with its 1.60 FX. This latest, largest-displacement version of its popular FX line produces the power from a remarkably compact package. The 1.60 weighs just 32.6 ounces and features a remote needle and a wing-shaped exhaust port that improves low-rpm torque. The O.S. 1.60 is available with a muffler (\$499) or without (\$479). Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).



### ELF-SIZE POWERHOUSE

Global has reset the bar for small 4-strokes with its new Magnum XL .30 RFS. Global has spent five years refining the design of its 4-stroke engines, and this is quite evident with the XL .30; it idles smoothly and with little vibration. But power is the key to any engine design, and this little .30 certainly earns the Magnum moniker; it happily spins to 10,000rpm. The fact that the street price for the XL .30 is only \$110 (\$40 to \$50 less than its competition) is icing on the cake. Global Hobby Distributors, (714) 964-0827, [www.globalhobby.com](http://www.globalhobby.com).





## TOOLS AND ACCESSORIES



### GOOD THINGS COME IN SMALL PACKAGES

We really like the MiniCraft line of precision power tools, and the latest to grace the *Model Airplane News* office is the Benchtop Disk Sander. This little powerhouse spins up to 18,000rpm—more than enough for almost any hobby application. And with the vented housing, you can sustain these speeds without its overheating. The sander also features a miter guide for precise control, and the unit comes with three sanding discs for just \$49.95. It works with the Variable Speed Transformer (\$34.95, shown), as do all the other MiniCraft tools. Or you can pick up the Universal Variable Speed Transformer (\$71.95) and run up to three MiniCraft tools at once. Hobby Hangar, (321) 727-8227, [www.hobbyhangar.com](http://www.hobbyhangar.com).



### DO THE TWIST

Here's a gift idea that helps any modeler on your list enjoy flying safely and easily all year round. With the Dynatron Starter from Sullivan Products, pilots will never have to try to start a giant-scale engine with an under-powered starter. The 24V Dynatron puts out over 1.5hp—enough to fire up any engine to 2.4ci (and most up to 3.5ci). The 2.5-inch-diameter Dynatron costs just \$75 and comes with gold end caps and an aluminum drive cone with a pulley groove. Sullivan Products, (410) 732-3500, [www.sullivanproducts.com](http://www.sullivanproducts.com).



### FILL 'ER UP!

Slimline specializes in fine-quality fueling accessories and exhaust systems, and its M1 Fuel Pump is one of our favorites. It is thoughtfully designed and simple to use—just what you need for quick and hassle-free refueling. The M1 features a rigid mount for easy operation and a CNC-machined O-ring to prevent leaks and keep fuel fresh. The M1 is a complete system that includes tubing and hardware for \$34.99, so you won't need to buy anything else. Slimline Products, (480) 967-5053, [www.slimlineproducts.com](http://www.slimlineproducts.com).



### DECAL THE HALLS!

This season, you can decorate more than just the tree if you find some Vita-Cal Decal Paper in your stocking. This innovative product from Vitachrome Graphics lets you print beautifully detailed, water-slide graphics right from your very own ink-jet printer! The process is easy and produces professional-quality results (see the November 2000 issue of *Model Airplane News*). The Vita-Cal Starter Kit costs just \$24.95 and comes with white and clear sheets plus a bottle of Vita-Clear transfer spray. Vitachrome Graphics, (800) 650-920, Ext.311, [www.vitachrome.com](http://www.vitachrome.com).



### TX TRINKETS

Hitec's Flight Packs are a great way to save time and expense when you're shopping to complete your radio system. Hitec has bundled a receiver matched to servos, switch harness and battery pack (except in the Feather Flight Pack) to get you in the air fast. The Micro Flight Pack (around \$100) is great for sailplanes, small electrics and up to .25-size glow aircraft. Shown above, the Universal Flight Pack (also around \$100) is a drop-in system for any plane up to 1.20 size. The Feather Flight Pack (approximately \$75) is designed specifically for indoor RC and park flyers. Hitec RCD, (858) 748-6948, [www.hitecrd.com](http://www.hitecrd.com).

### LET IT SNOW

Winter weather will never keep you grounded if you have the Great Planes *Real Flight Deluxe R/C Simulator*. While you're at it, grab the add-ons, and you'll be able to fly dozens of RC planes and helicopters in spectacular environments that use photographic images of real sites. There are hundreds of parameters to customize, including



planes, powerplants, terrain and atmospheric conditions. The 3D graphics are impressive, and the flight characteristics are very realistic, thanks to the *Real Physics* software. With the transmitter interface, you can even control *Real Flight* with your favorite radio! From \$329.99. Great Planes Model Distributors, (800) 682-8948, [www.greatplanes.com](http://www.greatplanes.com).



### A TOOLBOX FIT FOR SANTA'S WORKSHOP

Santa's elves came up with the SL Flight Box to keep their tools, supplies and spare parts for the sleigh orderly and accessible; lucky for us, it works great at the field as well. It incorporates twin fuel tanks (which can be linked or used independently), several storage compartments and detachable legs; an adjustable divider platform, removable 4-drawer toolbox and retracting cradle arms are optional. Everything is made of a durable, solvent-resistant plastic, so it will be around for many holidays to come. The basic Flight Box costs \$122.95; the complete kit with box and all three accessories can be bought for \$169.95. SL Model, (253) 576-5353, [www.slmodel.com](http://www.slmodel.com). ★







by Bertil Klintbom



## An easy-to-build sport-scale model for electric or glow power

### CONSTRUCTION

I have built and flown RC models since 1976 and I have always been interested in racers. About two years ago, I

became interested in electric models, and I was one of the first in my club to try an electric-powered one. I then started to design and build this little sport-scale Cassutt, and I bought a geared AstroFlight\* 020 brushless motor to power the model. The Cassutt is a sleek little homebuilt racer, and there are plenty of colorful paint schemes to choose from. I opted for "Yellow Peril," a Reno winner that I found in *Sport Aviation* magazine.

The model uses lightweight construction, and there are lots of alternatives to power it. There is no need for an expensive motor; you can use a Speed 400, or go with a small glow engine. The model is small, and that makes it perfect for flying from small fields and schoolyards.



Decide which power system you want to use; if you build the electric version and want it to be very light, I suggest that you use formers made from rigid foamboard. You can find these with or without paper surfaces in artist supply shops. I used foamboard without paper for my model because it is the lightest alternative and it's strong enough. If you want to use wood for the formers, I suggest that you use 1/8-inch balsa formers laminated on both sides with 1/64-inch ply. Former 1 should be made of 3mm (1/8 inch) plywood, and the different power systems require different cutouts in the former (refer to the plan). You should also decide how many servos you want to use. Rudder control is not really necessary but can be incorporated if you like.

After you have made these choices, it is time to start cutting. I have drawn a conversion table from inches to metric on the plan, but please note that the dimensions still vary a little, and you may need

# CASSUTT RACER





to adjust some parts to suit before you start cutting.

• **Fuselage.** The fuselage is built using formers and sheet sides with the top and bottom planked with balsa. Build the fuselage over a straight line drawn on the building surface to ensure everything remains warp-free. The construction is simple and straightforward.

I made the engine cowl and the top hatch out of fiberglass, but you can form them easily from foam and cover them with light glass cloth and resin. Once the resin has set, cut away the inside foam. An alternative is to build the parts from balsa and thin plywood formers. Glue the side cheek fairings to the model after the wing has been permanently glued to the fuselage.

I made a motor mount from pieces of plywood to suit my geared motor. Here, you have to adjust the plan to fit the motor you have chosen (the plan shows a Speed 400). The flight-battery-pack location is shown on the plan, and a balsa floor prevents the pack from moving. The bottom hatch that allows the removal of the flight pack is hinged at the front and locked with a half-turn bolt at the rear. In the bottom sheeting behind the wing, the plan also shows an outlet opening that allows cooling air to move through the fuselage.

• **Wing.** The wing is built flat on the building surface and has no dihedral. Make the wing ribs of medium-weight, 1/16-inch balsa and glue them to the LE,



the spars and the TE. Then plank the entire wing on both sides. Make the ailerons from conventional balsa TE stock. Make the wingtips from solid balsa blocks, and hollow them out to save weight before you glue them to the wing. The center wing where it will be inside the fuselage is reinforced with a 1mm (1/32-inch) plywood plate with cutouts in it for the servos. Test-fit the wing to the fuselage, and when you are satisfied with the fit and have ensured that it is correctly angled to the fuselage, glue it into place

permanently. On top of the wing, glue into place the wood guides for the top hatch, as shown on the plan.

• **Stabilizer and fin.** No problems here; construction is absolutely basic. All parts are made of 1/8-inch balsa sheets and glued into place. The only tricky part is to install the hinges in the relatively thin balsa section. I suggest that you use Mylar hinges and wait until you've covered the parts before you cut

the hinge slots. Slightly taper the elevator and rudder TE's. If you don't intend to use a moving rudder, glue it permanently to the fin, making sure it is set at neutral.

• **Landing gear.** I made a carbon-fiber landing gear for my prototype weighing only 12 grams, and I used a music-wire tailskid, but I have since opted not to use a gear. This is up to the modeler, but like most small electric models, the Cassutt likes to be hand-launched, so there is no need for landing gear.

## SPECIFICATIONS

**Model:** Cassutt racer

**Type:** sport scale

**Wingspan:** 30.25 in.

**Wing area:** 242 sq. in.

**Length:** 29 in.

**Weight:** 24.5 oz.

**Wing loading:** 15.3 oz./sq. ft.

**Power used:** geared  
AstroFlight 020 brushless  
(Speed 400 or small glow  
engine also acceptable)

**Radio req'd:** 3-channel  
(aileron, elevator and throttle/speed control)

**Comments:** the Cassutt  
racer is a sleek little sport-

scale model that is easy to build and a lot of fun to fly. Kept light, it will really perform, and I recommend the use of foamboard for the fuselage formers. You can also use a Speed 400 motor or a small glow engine. I removed the landing gear and hand-launch my model.

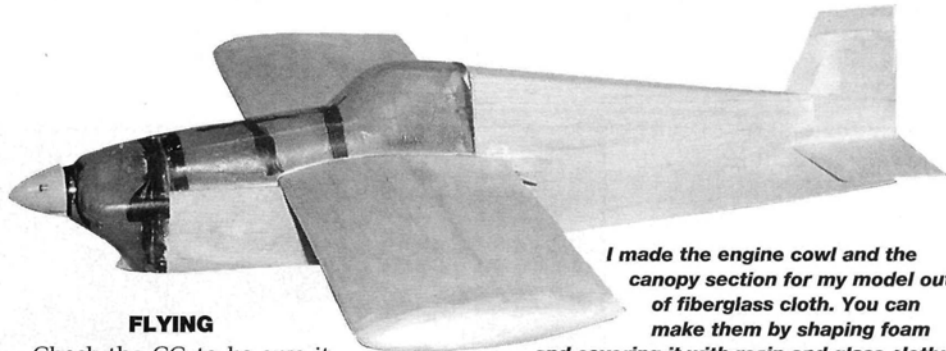
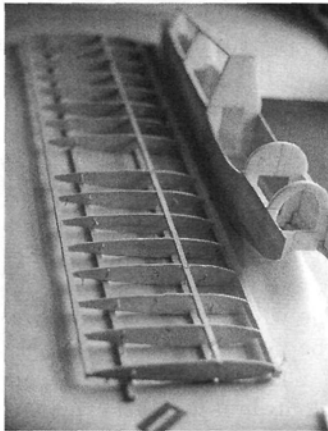




## CASSUTT RACER

• **Finishing.** Any type of lightweight covering is OK, but I used very light fiberglass cloth and epoxy resin. I think this method does not make the model any heavier than applying film or silkspan covering. It creates a strong and scratch-resistant model, too. I wet-sanded the model and sprayed on the color coats sparingly. It is important not to accumulate too much weight during covering and painting, so I usually check my model's weight during the process. For an electric version, the choice of paints is vast—no glow fuel to spoil the model!

• **Radio installation.** I used two Hitec\* miniservos for ailerons and elevator. The pushrods are plastic for the elevator and music-wire torque rods for the ailerons. I made a cutout in the center of the wing for the servo leads that go to the RX and for the BEC lead that goes to the speed controller. I used a Multiplex\* Picco TX.



## FLYING

Check the CG to be sure it is at the location specified on

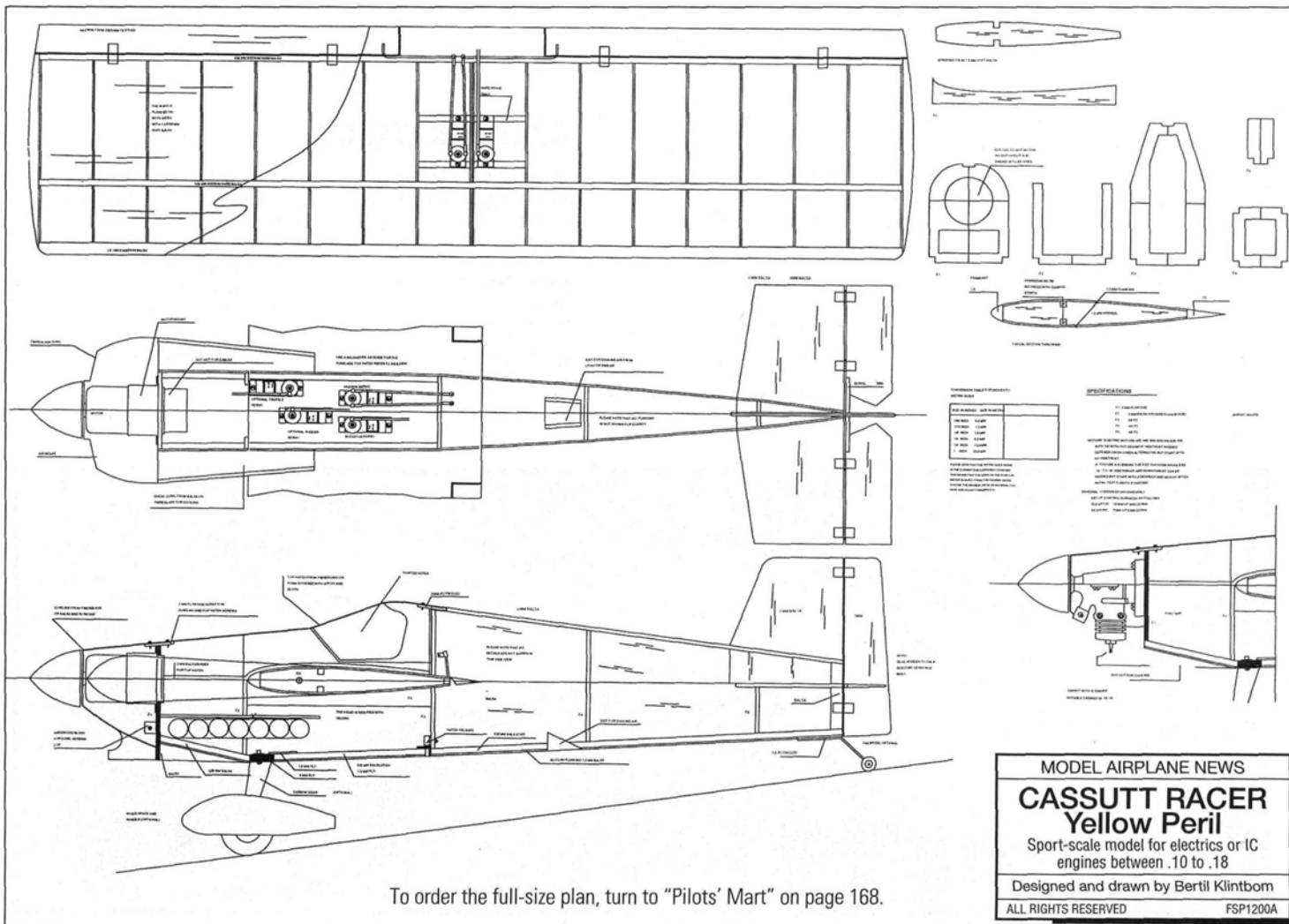
the plan; do not try to fly a tail-heavy model! When you insert the flight pack, check for any chance of backward movement. Use foam padding to ensure that the pack stays in place. If it moves backward during launching, you

**The Cassutt has a very simple design and is easy to build. Here you see the fuselage and wing on the workbench. Note the foamboard formers used in the fuselage.**

*I made the engine cowl and the canopy section for my model out of fiberglass cloth. You can make them by shaping foam and covering it with resin and glass cloth; you can also make the parts of balsa.*

end up with a tail-heavy plane. I know the hard way what happens—more glue required!

My first test flight turned out badly. My wife launched the model against the wind, but I did not have the proper motor thrust, and the flight was aborted within the field with a broken motor mount. The problem was that I did not fully understand the motor and the gearbox. I solved the problem by changing the propeller (different size and pitch), and I also switched from a 7- to an





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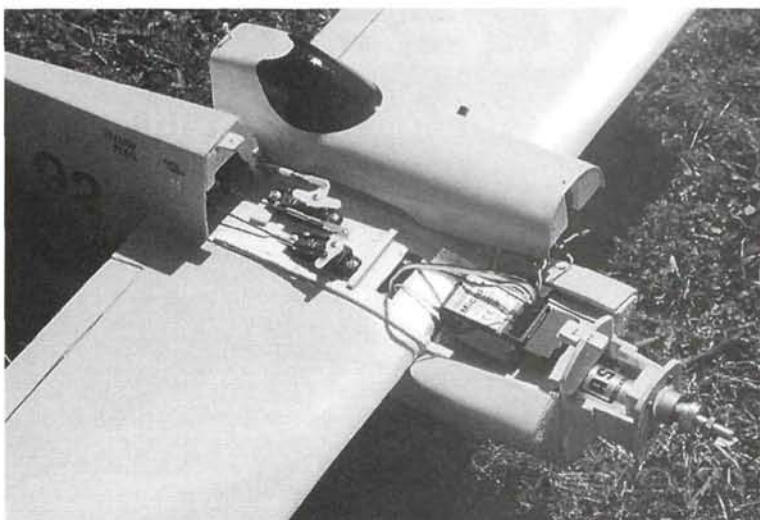
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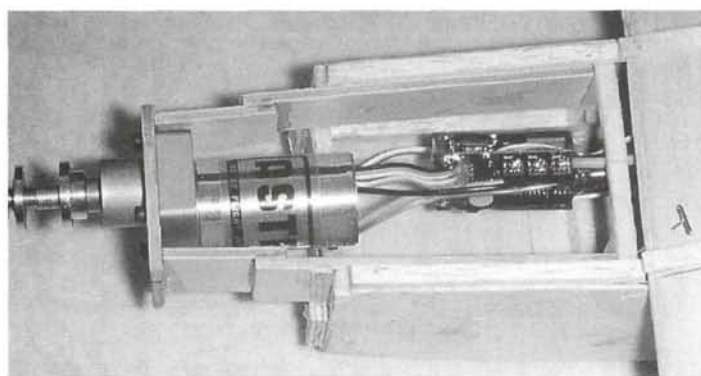
## CASSUTT RACER



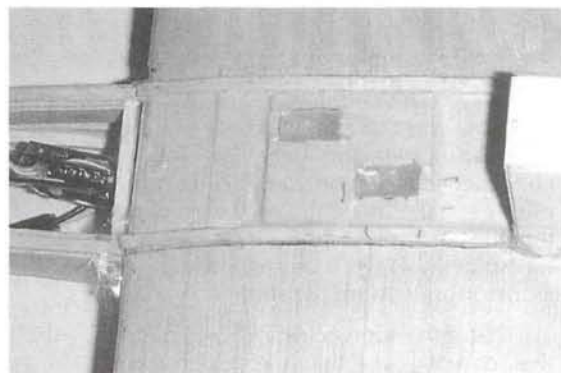
*With the canopy section and cowl removed, there is unrestricted access to the model's hardware and radio. Note the position of the servos and the receiver.*

8-cell 800AR flight pack. This makes the model a good performer.

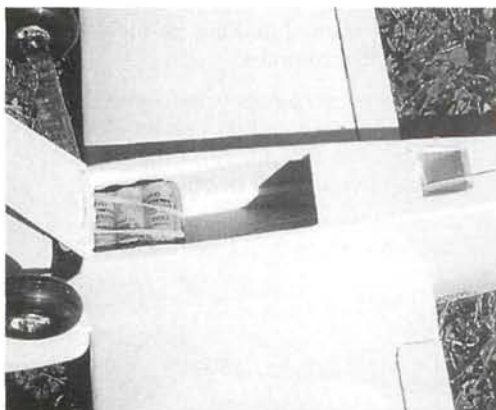
I always hand-launch the model. Get a helper for the first launch when you may have to trim out the model. The Cassutt tracks straight and has no bad habits. If you deadstick it during a landing, remember to keep the speed up. The model does not stall until the speed is very low, but a stall near the ground usually gives the same result every time—more glue needed. The flight characteristics, of course, differ from model to model, mostly depending on weight and how straight the model has been built. The Cassutt can be flown with many alternative motors and flight



*I used a geared AstroFlight brushless motor to power my Cassutt. Any Speed 400 motor or a small glow engine will also do nicely.*



*The wing is permanently glued to the fuselage to form a one-piece model. Here the wing is being finished with glass cloth and resin. Note the plywood reinforcement plate at the wing center section.*



*The hinged belly hatch makes changing flight battery packs easy. Also note the cooling vent cut out of the fuselage bottom just aft of the wing.*

packs. I am sure a regular 400 motor driving the propeller directly would do nicely. The design is also ideal for a small glow engine, and I am thinking about buying an MDS .18 in the near future.

Happy landings!

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ✦*



# Electric Ducted-Fan Jets

by the staff of Model Airplane News



Kyosho F-16 Falcon.

**A** renaissance is occurring in electric flight, and one of the several rapidly expanding segments is that of electric ducted-fan (EDF) aircraft. Whether you are an intermediate-level flier or a hot-dogger who's looking for a high-performance jet that will go 75mph or faster in "stock" configura-

tion, there is an EDF plane for you. In short, a new—and surprisingly diverse—world of EDF aircraft and fan units is now available. Electric jets, which traditionally have been smaller models, are growing in size. Electric-powered fans with inside diameters of up to 5 inches are becoming available, and multi-fan EDF models are available with wingspans greater than 6 feet.

Our chart sampling EDF aircraft sold in the U.S. (if you have access to the Web, visit the noted websites!) represents only a cross-section of available products. The cited airplanes illustrate the surprising variety available in the EDF category,

*A new generation of sport and high-performance models is here!*

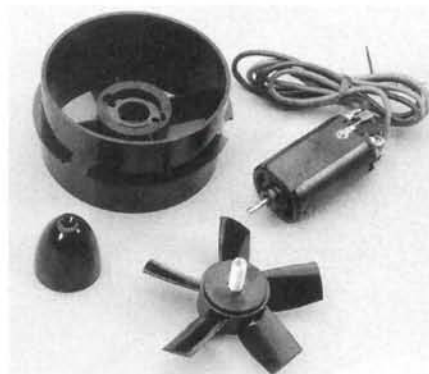
and more are coming soon.

If you are just getting started in EDF airplanes, Kyosho\* has three great models to choose from: a T-33, an F-16 and a twin-fan Learjet. They are



Kress Jets RK-720E fan samples.

electric ducted-fan units, Bob continues to develop new fan configurations, some of which are shown below. He treats maximum allowable rpm conservatively and opts for more fan blades to produce the desired thrust. He notes that although this chart is based on Kress Jets products, similarly configured fan units will generally perform like those shown in the chart. The chart can be used as a tool to develop a rough idea of (1) the thrust that a Kress or similar fan may produce using a high-end motor, and (2) the power it will absorb when operating under similar rpm.



Kyosho fan and AP29L motor.

## Fan size, rpm, power absorption and thrust

This chart, by Bob Kress of Kress Jets Inc., shows the relationship between fan configuration, rpm, power and thrust. Bob is a retired vice president of Grumman Aircraft who led the design team that produced the F-14 Tomcat, and he is an expert on propellers and fanjets. In addition to pioneering technical refinements that helped lead the way to the current generation of elec-

Tractor fans	Jet tube i.d. @ rotor/in.	No. of blades	Rpm max. allowed (1,000s)	Power/watts @ max. allowed rpm	Thrust @ max. allowed rpm (ounces)	Comments
RK-709E <sup>(2)</sup>	...3	...7	...28	...769	...51	
RK-720E <sup>(2)</sup>	...3.33	...7	...28	...976	...65.7	
RK-20E <sup>(2)</sup>	...4.13	...5	...25	...819	...69.1	RK-20 or AP-2 variable-pitch rotor
RK-740E <sup>(4)</sup>	...4.13	...7	...25	...2770	...156	
RK-40E <sup>(4)</sup>	...5.13	...5	...25	...2433	...165.5	

### Pusher fans

KP-1E <sup>(1), (3)</sup>	...3	...5	...25	...237	...26	...AP-1 rotor CCW
KP-2E <sup>(2), (4)</sup>	...3	...7	...28	...769	...5.09	...RK-709 rotor CW
KP-2G	...3	...5	...25	...237	...26	...AP-1 rotor CCW; glow
KP-2G Typical performance powered by 1/2A engine:	...19	...104	...15.0	...TD-049		

### Notes:

<sup>(1)</sup> for Speed 400 1.14-in.-diameter-class motors. <sup>(2)</sup> for 540/550 1.47-in.-diameter-class motors. <sup>(3)</sup> also available with i.d.s of 2.63 in. (Mini Fan 480) and 2.88 in. (slightly smaller than 3-in. Kyosho). All 3-in.-i.d. fans fit Kyosho models. Center body lengths to fit brushless or regular motor controllers can be ordered from Kress Jets at no charge. <sup>(4)</sup> 1.75- and 2-in.-diameter center bodies are used for larger motors.

Key to abbreviations: i.d. = inside diameter; CW = clockwise; CCW = counterclockwise.



affordably priced and offer good handling characteristics for intermediate-level pilots who wish to explore the emerging world of electric jets. Distributed by Great Planes\* and widely available in hobby shops, these aircraft have helped propel the EDF craze forward.

### THE HISTORY

The history of EDF starts with glow power. In the 1950s, Berkeley Models sold a line of glow-powered ducted-fan models that used stamped-aluminum,



*Graupner Comet.*

6-blade rotors. On the other side of the pond, the English also pioneered the Veron glow-powered fans. By the early '90s, the Morley EDF had arrived from the U.K. It was a 10-blade fan that was powered by "RC car" motors. The British-



*Graupner fan unit.*

designed Electro Jet fan came soon after and was one of the first really flyable fans that showed improved efficiency.

Electro Jet was eventually bought out by Oliver Wennmacher, who currently produces the very successful WeMoTec fans. Meantime, in the U.S., Kress Jets\*

had produced the RK series of electric fans, and these and other electric fan lineages continue to evolve.

In recent years, demand for new fan/motor combinations and new model airframes has grown worldwide, and the results are impressive.

### THE FUTURE

Not only are inexpensive electric motors becoming more powerful, but a new gen-

eration of brushless motors also promises lower cost and high performance. Where will these developments take the hobby? On the one hand, it appears that the ever more efficient fan units being brought to market may offer new possibilities for small glow applications. On the other hand, high-performance EDF aircraft are now flying at speeds greater than 100mph. Electrics will always have the



*EJM composite Mini A-10.*

advantages of clean, quiet power and ease of operation. Will the weight and duration penalty of batteries be mitigated by fuel cells or new Ni-Cd, NM-HY or lithium cells? Time will tell. What is certain is the continued, rapid evolution of EDF technology.



*Kyosho Learjet.*



## Companies of Note

### Bill Griggs Models

Bill Griggs provides a starting point for the modeler who wants to buy an affordable kit or an entry-level trainer. His "Screamer," a Don Belfort design, is ideally suited for flying in large, park-like open spaces. See also his BD-10 and Panther designs at <http://www.aiusa.com/bgriggs/>.



*The Screamer.*



*Framed EAM  
MiG-41 Rapier.*

<http://eam.net>. Dave was quick to point out his laser-cutting, CNC-foam cutting and molded-glass resources, which are targeted at further expanding his product line.

### Electric Aero Modeling USA

EAM has an impressive product selection, to say the least. We counted 21 EDF aircraft in EAM's online catalog, nine planes in development (don't miss their "Skunkworks" Web page! An XB-70 EDF?!). And various semikits (still to be priced as we went to press). Owner Dave Roberts noted that EAM's goal was to offer a wider range of quality EDF products than any other source, and EAM's website appears to fulfill this goal; see

### Electric Jet Factory

The Electric Jet Factory focuses on researching "next steps" in EDF materials and technology. Pushing forward with all-composite designs that are equipped with landing gear for ROG takeoffs (see the MiG-15, Mini A-10 and Rafale designs), the company is working hard to build a "high-performance" reputation. Kress Jets and the Electric Jet Factory have announced plans to pursue new fan configurations that will further raise the bar. See [www.ElectricJetFactory.com](http://www.ElectricJetFactory.com) for more information and video clips of aircraft in flight. Owner Robert Wagoner is a member of the American Institute of Aeronautics and Astronautics (AIAA) and has been involved in ducted-fan and airframe projects ranging from wind-tunnel flow analysis to experimental NASA-related test aircraft.



*EJF Rafale M.*

### K&A Models

Owner Ken Williams noted that K&A's approach is to provide aircraft that can be equipped for sport flying (e.g., 45mph) or high-performance EDF flying (75mph plus). Skewing slightly from pure scale to enhance flight characteristics, K&A offers an L-39 Albatros and a MiG-15 (among other products). As Ken put it, "How advanced you go is just a matter of your comfort level." Check out <http://www.kamodels.com/kitindex.htm>. Models to watch for from K&A include an Me 262 and an F-84.

### ShredAir

Dieter Mahlein of ShredAir noted that ShredAir's mission is to make available to RC pilots high-end products that are otherwise difficult to obtain. This company is dedicated to high-performance engineering and the highest level of service. Its F-86, F-16 and L-39 will be followed by a twin-fan EDF F-18 in 2001. For more information, see <http://shredair.com/home.html>.



*ShredAir F-86.*

### FURTHER WEBSITES OF INTEREST

<http://members.aol.com/offshoreel/index.htm>  
[www.aeronaut.de/](http://www.aeronaut.de/)  
[www.gloeckner-s.com/GMT/english/hframe.htm](http://www.gloeckner-s.com/GMT/english/hframe.htm)  
[www.jkci.com/kressjets](http://www.jkci.com/kressjets)  
[www.robbe.com](http://www.robbe.com)  
[www.wemotec.com](http://www.wemotec.com)

*Editors' note: this article is primarily about airplanes—not fan units or motors. These will be addressed in future articles. ✈*

Manufacturer/ website	Kit
Bill Griggs Models <a href="http://www.aiusa.com/bgriggs">www.aiusa.com/bgriggs</a>	BD-10 ..... Electro Screamer ..... F9F Panther .....
Cox Models <a href="http://www.estesrockets.com">www.estesrockets.com</a>	Boomerang ..... XB-29 Airlifter .....
Dare Hobby Distributors <a href="http://www.darehobby.com">www.darehobby.com</a>	A-10 Warthog .....
Electric Aero Modeling USA (EAM) <a href="http://eam.net">http://eam.net</a>	BAE 146 (transport) ..... Dornier 328 jet ..... F4D Skyray ..... MiG-41 Rapier .....
	MiG-17C Fresco ..... T-45 Goshawk .....
Electric Jet Factory <a href="http://www.electricjetfactory.com">www.electricjetfactory.com</a>	Heinkel-162 ..... MiG-15 (composite) ..... Micro A-10 Warthog ..... Mini A-10 Warthog ..... Mini A-10 (composite) ..... Rafale M ..... Rafale M (composite) .....
Kyosho (Great Planes) <a href="http://www.kyosho.com">www.kyosho.com</a>	F-16 Falcon ..... Learjet ..... T-33 Shooting Star .....
HobbyFlite, Inc. <a href="http://www.hobbyflite.com">www.hobbyflite.com</a>	Boeing 747 .....
Hobby Lobby <a href="http://www.hobby-lobby.com">www.hobby-lobby.com</a>	Graupner Comet .....
K&A Models <a href="http://www.kamodels.com">www.kamodels.com</a>	L-39 Albatros ..... MiG-15 ..... Mini A-10 Warthog .....
ShredAir <a href="http://www.shredair.com">www.shredair.com</a>	F-86 Sabre ..... F-16 Falcon ..... L-39 Albatros .....



# A Sample of Ducted-Fan Kits

Span (in.)	Weight RTF (oz.)	Fan unit kit only	Retail price	Remarks
.28	.26 to .34	WeMoTec480	\$90	Laser-cut balsa
.32.5	.15 to .17	Hiline Redflame Blaster	\$50	Laser-cut balsa
.42	.34	WeMoTec480 / Kyosho	\$90	CNC-cut foam
.33.5	7.25	Cox Electrofan	\$129.99	Foam flying wing, 1 channel
.50	11.9	(2) Cox Electrofan	\$219.99 (complete)	Foam air-transport twin
.30.5	14.8	(2) KP 440	\$59.95 (w/out fan)	Laser-cut balsa w/built-up fuselage
.74.8	105.6	(4) Rojet 410	\$299.95	Molded polystyrene
.52	57.6	(2) WeMoTec Mini Fan 480	\$289	GRP fuselage, pressed-form prebuilt one-piece wing, vacuum-molded nacelles
.30	.29	Mini Fan 480	\$119	Balsa built-up, vacuum-formed inlets and ducting
.29	.32	AP29L, HW 609 Mini Fan 480, RK 720 Graupner 500 - 600	\$149	Laser-cut balsa, ply Vacuum-formed turtle deck Canopy
.31	.30 (w/out batteries)	Kyosho AP29L	\$175	Fiberglass carbon veil reinforced fuselage, foam-core wings
.32	.33	RK 720	\$159	Fiberglass fuselage, foam-core, balsa-sheeted wings
.37	.56 to .64	Mini Fan 480 or HW 609	\$229.95	Epoxy-fiberglass fuselage, balsa-covered wings
.40	.80 to .88	Midi Fan	\$229.95	Epoxy-fiberglass fuselage balsa-sheeted foam-cores
.28	.14 to .16	(2) EDF 200	\$69.95	Laser-cut balsa and foam
.41	.45	(2) EDF 400 or (2) Mini Fan 480	\$98.95	Laser-cut balsa Vacuum-formed parts
.41	.36	(2) EDF 400 or (2) Mini Fan 480	\$159.95	All-composite fuselage, wings, epoxy-fiberglass
.33	.48 to .54	Midi Fan	\$229.95	Fiberglass fuselage, laser-cut parts and foam-cores
.33	.54 to .64	Midi Fan	\$299.95	All-composite fuselage, wings, canards, fin
.36.8	.40	Kyosho AP29L	\$249.99/\$169.99*	Molded styrene with foam wing fuselage and wings skinned in plastic film
.57.5	.88	Kyosho AP29L	\$399.99/\$299.99*	Molded styrene foam, wings, tail and fuselage prefinished with plastic film
.46	.37	Kyosho AP29L	\$199.99/\$125*	Molded styrene with foam wing; wings skinned in plastic film
.48	.11 (kit only)	(4) EDF 200	\$133	Molded, rubberized Styrofoam
.53	.53	Graupner GR1401	\$139	Fiberglass fuselage foam balsa-sheeted wing
.48	.45 to .50	Kyosho or WeMoTec	\$159.99	Fiberglass fuselage, intake, exhaust liners; foam-core wings, balsa and ply parts
.38	.45 to .55	HP 609, WeMoTec, or Kyosho	\$169.99	Fiberglass fuselage, intake, exhaust liners; foam-core wings, balsa and ply parts
.31	.18 to .20	KP 44 Mini Fan	\$59.99	Precision-cut balsa and ply, foam-core wings, vacuum-formed parts
.47.25	.34 (kit only)	DS-51 3-ph Schübeler	\$395 to \$475	Molded epoxy-fiberglass w/Kevlar and carbon-fiber support
.48.03	.48 (kit only)	DS-51 Schübeler	\$425 to \$625	Molded epoxy-fiberglass w/Kevlar and carbon-fiber support
.50	.42 (kit only)	DS-51 Schübeler	\$410 to \$450	Molded epoxy-fiberglass w/Kevlar and carbon-fiber support

\*Retail/street prices



*A giant Golden Age classic*

TOP FLITE

GOLD EDITION

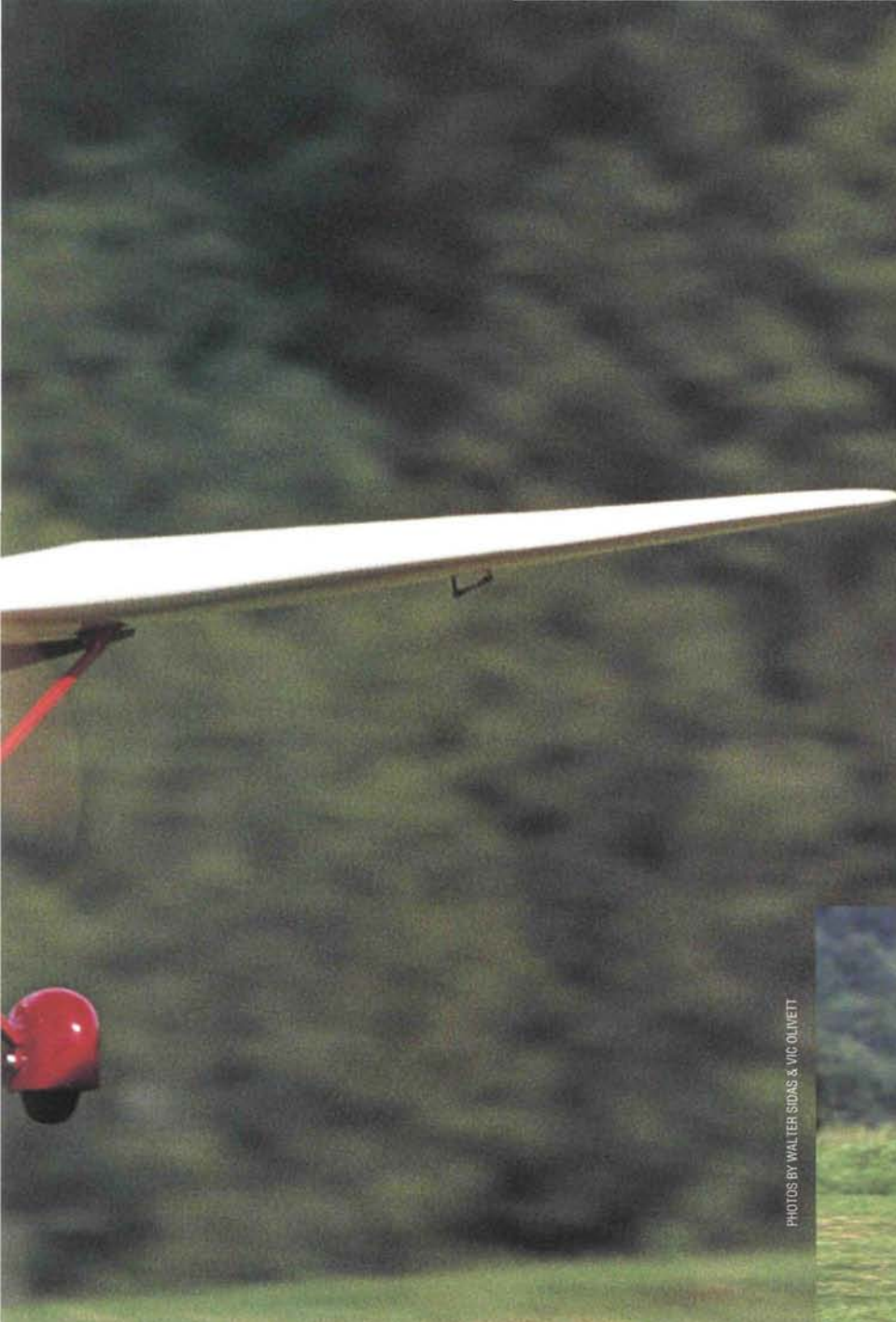
# *Stinson Reliant*

by Vic Olivett & Bill Steffes



**W**hile planning our first Warbirds over New York event a few years ago at the South Albany Airport, we noticed a beautiful old Stinson Reliant way down at the end of the back tie-down line. As we walked toward the Golden Age classic, airport co-owner Jim Feil told us that the plane had not been moved in more than 10 years. It didn't take an expert to see that this old beauty had been neglected. With its flat tires, faded paint and worn fabric, this plane would be a great restoration project. Well, maybe in our next life.





PHOTOS BY WALTER SIDAS & VIC OLIVETTI



## SPECIFICATIONS

**Model:** Gold Edition  
Stinson Reliant SR-9  
**Manufacturer:** Top Flite  
**Type:** giant sport-scale  
**Wingspan:** 100.5 in.  
**Wing area:** 1,487 sq. in.  
**Weight:** 16 to 25 lb.  
(19.5 lb. as flown)  
**Length:** 67.8 in.  
**Radio req'd:** 4 to 5  
channels (6 channels  
w/8 servos as flown)  
**Engine req'd:** 1.08 to 1.99  
2-stroke, 1.20 to 1.60  
4-stroke, or 25 to 35cc gas  
**Engine used:** U.S.  
Engines 41cc with a  
Top Flite 18x6-10 prop  
**Price:** \$279.99

**Features:** laser- and die-cut wood parts; ABS cowl, wheel pants and gear, strut and tailwheel fairings; two-piece wing; rolled plan; instruction manual; and hardware.

When we saw a flyer for the new Top Flite® Gold Edition Stinson Reliant, Bill and I looked at each other and immediately called Chris Chianelli at *Model Airplane News* to see whether we could review this kit. It arrived a few weeks later; we would finally get our chance to do our Stinson—at least, a miniature version.

We opened the box to find the instruction manual, four sheets of rolled plan, balsa sticks, sheeting, hardwood parts, hardware and

numerous plastic parts. We noticed on the plan that the fuselage section had to be cut and joined, as with many of the larger Top Flite kits. The 56-page manual is filled with photos, tips, instruction notes and a complete list of all the additional items needed. As you remove the parts from the die-cut sheets, mark them for easy identification later. Same goes for the laser-cut parts. The die- and laser-cutting in this kit are exceptional.

**Comments:** not many planes create as much excitement at the flying field as the Stinson does. Top Flite has done a great job with this kit.

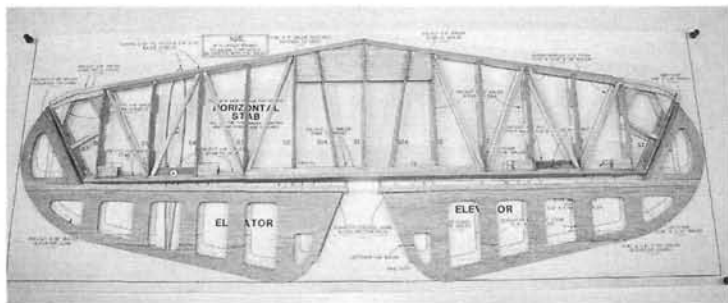
### Hits

- Great instruction manual.
- Easy to build.
- Excellent laser- and die-cutting.

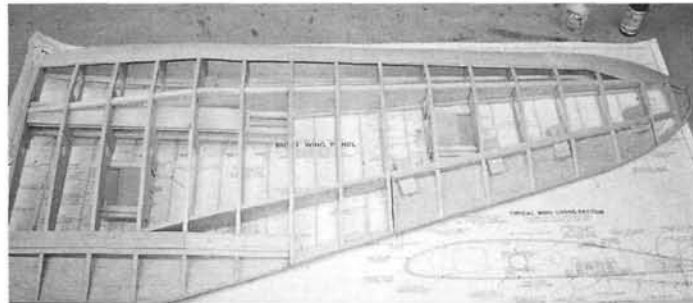
### Misses

- Difficult to fit cowl to fuselage.
- Windscreen and front cabin area pieces are difficult to fit and assemble.





Left: the horizontal stab and elevator over the plan. If you use a larger gas engine, you should sheet the stab for added strength. Right: the completed right wing panel over the plan, showing aileron and flap assembly in place.



## TAIL SECTION

Construction starts with the tail section's horizontal stab and elevators. All of the ribs have temporary tabs that you can pin down directly to the plan (don't forget to put down your Great Planes® plan protector!). The construction is straightforward. Depending on the engine that you'll use, you may or may not need to sheet the entire stabilizer (we did). Top Flite recommends a 1.08 to 1.60 twin 4-stroke or the U.S. Engines® 35cc gas engine. We thought if we were going to use gas, we might as

well opt for just a touch more horsepower and decided to use the U.S. Engines 41cc. The elevators are built using a balsa core and ribs, which make them very strong. The vertical stab and rudder are built in the same manner as the stab and elevators. The trailing edges of the elevator and rudder are laminated with 1/16-inch-thick balsa strip stock.

## BUILDING THE WING

Wing construction starts by laminating and joining the

ribs, spars and joiner box rails. Make sure you take your time here, as this assembly will determine how straight your wing will be. When you start to frame the wing, there are 16 ribs and four spars: a main spar, an aileron and flap spar and an inner main spar. The ribs are slotted along with the spars to make an egg-crate design, which adds to the overall strength of the wing. Make sure the ribs lie over the plan where indicated without forcing them. Sand the notches in the ribs if necessary

# FLIGHT PERFORMANCE

## • TAKEOFF AND LANDING

After we had checked all of the control surfaces on the Stinson several times, we turned it into the wind. As we advanced the throttle, the tail came up and the Stinson tracked straight down the runway. In about 300 feet, the Stinson was airborne with very little up-elevator. Climb-out was very strong, and no added trim was needed. The U.S. Engines 41cc was more than enough power for the Stinson. After the first turn away from the runway, we brought the power back to about 1/2 throttle and the Stinson settled into a very nice cruise. The plane was very stable and required very little trim. The control settings recommended in the manual were perfect.

Landing the Stinson is very predictable; it lands very much like any other high-wing plane. Just line it up and bleed off some of the power, and the Stinson will settle in very nicely with just a touch of up-elevator before touchdown. Rollout was very smooth and straight.



## • LOW-SPEED PERFORMANCE

When you see this big bird with its tapered gull wing, you might think it was built more for speed and not slow flight. With the flaps extended and a little power, the Stinson will fly very slowly. And even at slow speeds, the controls are all very effective. The plane had no tendencies to fall off into a tip stall; instead, the nose will just drop slightly and recovery is accomplished by adding some power.

## • HIGH-SPEED PERFORMANCE

When we decided to go with the U.S. Engines 41, we thought we would need the extra power because this was such a large model. After the first flight, we found that it was more than enough for the Stinson. At full power, the Stinson is fast for a large high-wing plane. Just point the nose in any direction, and the Stinson will fly as though it were on rails.

## • AEROBATICS

Although we can't imagine many full-scale Stinsons doing so, loops and rolls were very smooth and crisp. Looping the Stinson just requires pulling back on the stick and remembering to pull the power back on the downside of the loop. With slight nose-up and full aileron, the Stinson will do a smooth, clean roll.

Overall, we think that the Top Flite Stinson has excellent flight performance for a large high-wing model.



## STINSON RELIANT



for a good fit. Now glue all of the ribs in place with Zap\* CA+. The only part that took a little extra time was fitting the joiner box. Now trial-fit the root rib, the top inner main spar and the cardboard wing-joiner tube. Use the supplied dihedral gauge to check the angle of the root rib, then go ahead and glue everything together. Add the leading edge and wingtip, along with  $\frac{3}{32}$ -inch-thick wing sheeting, which goes only from the leading edge to the main spar.

The aileron and flap have center cores and are tack-glued into place. When we sanded the ribs for the aileron and flap, we put masking tape over the main ribs so that we wouldn't sand them down in the process. A hinge drill guide is supplied in the kit for drilling the wing and flaps. This is important because the angle of the hinges must be correct for proper flap operation. We used Robert\* Hinge Points on all of the surfaces.

### FUSELAGE ASSEMBLY

Building the fuselage begins by laminating and framing bulkheads 3 through 9. Take your time; this assembly will ensure that your fuselage will be built square later. We used slow Zap here. Place the main stringers over the plan, then the bottom bulkheads 3 through 9. As you proceed, use a square to be certain the formers are vertical. Each former is braced by  $\frac{1}{4}$ -inch-square balsa to ensure alignment. Care must be taken here, as some of the bracing is permanent and some is removed later. Before you position the bottom stringers, place a straightedge from former 5 to 9 along both sides; this should be straight; if

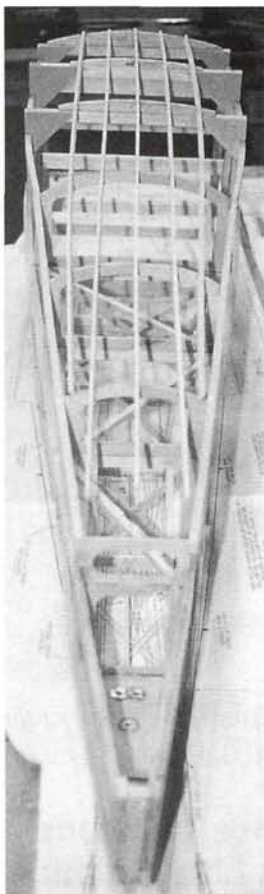
it isn't, remove any high spots. We had to remove  $\frac{1}{4}$  inch from former 6 and  $\frac{1}{8}$  inch from 7. Now go ahead and place all the bottom longerons and Zap them into place.

When the bottom of the fuselage is complete, add the top formers, along with the stringers, keeping all the formers straight. The next step is to build the forward fuselage sides; there is a left and a right side, which will build in the right thrust and downthrust that is called for. When this is complete, go ahead and put on the stabilizer and the vertical fin, making sure that everything is square and level. Now it's time to add the wing to the fuselage by building another joiner box and placing it on top and in front of former 4. I found that the rear mount should be in front of—not behind—former 5; if you

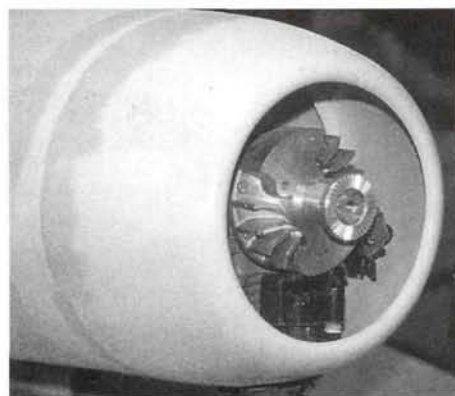
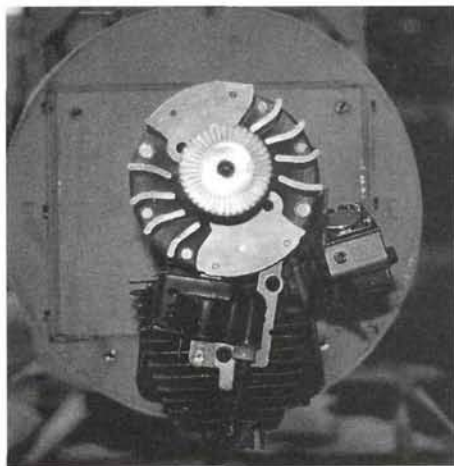
place it as shown on the wing plan, it will be too far back. I also added an  $\frac{1}{8}$ -inch-thick aircraft-grade wood spacer to the fuselage rib to strengthen the lite-ply rib where the bolt goes through. (Top Flite has added this modification to subsequent kits.) Now place the assembled wing and fuselage rib with the joiner tube in the fuselage joiner box. Check the measurements from the wing to the tail from both wingtips. If the measurements are OK, go ahead and glue in the joiner box with some Zap 30-minute epoxy. Sheeting the front half of the fuselage is somewhat difficult because the supplied wood is fairly hard, but it's manageable if it is soaked first in ammonia and water. We opted to make both of the model's doors operational solely for the ease of bolting on the wing; these were not difficult to construct.

Time to trim and mount the plastic parts supplied in the kit (cowl, windscreen, wheel pants and landing-gear and strut fairings). The fit was good, but the trim lines were

light if not totally missing—especially on the cowl, where the blisters are supposed to go. Fitting the cowl to the fuselage is a chore because the firewall is down and to the right. The rear of the cowl must be trimmed to compensate for this. If it isn't, the cowl will go on at an angle, and the engine centerline will be up and to the right. We recommend that before you glue in the for-



*The framed-up fuselage, including tailwheel tiller arm, before the cabin has been sheeted.*



*Top: U.S. Engines' 41cc engine is mounted on the firewall with built-in offset to the right and down. Above: final fit of the cowl to the fuselage. Notice that the engine fits completely inside the cowl.*

ward fuselage sides, you trim the left side to match the right side and also remove the downthrust. It's much easier to shim the engine to get the required right and downthrust than to cut the cowl. Now you can mount the cowl without any trimming whatsoever. Most of the other plastic parts fit well, although there were just too many pieces in the windscreen and front cabin area for a good fit. A one-piece, molded-plastic unit of the entire front section would have been nice. All of the plastic parts are molded of heavy ABS and should stand up to the stresses a larger model will encounter.

### FINISHING

Now for the fun part. We decided to use 21st Century\* fabric in red and cream and copy the full-size Stinson at South Albany Airport. We thought that this scheme would give the Stinson a little more contrast and character.

Although we followed the instructions on the 21st Century paint cans, we noticed that the paint color was a poor match to the fabric. Bill removed the paint, re-sanded each part and tried it again with a fresh can of paint. Same results; the colors were a poor match. If you want to compete with your model, we highly suggest that you



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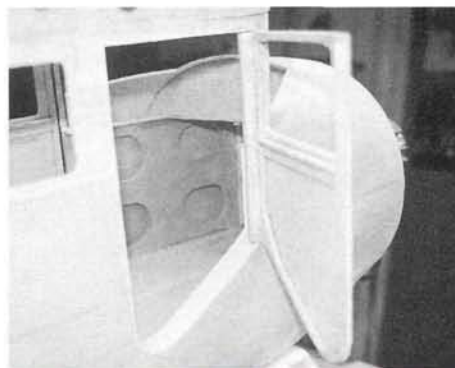
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## STINSON RELIANT



**Top:** the hinged cabin door with functional latch (following the plan) allows easy access to wing bolts. **Above:** the completed interior showing Top Flite's instrument panel.

have matching paint custom-mixed at an auto-supply store.

We used a Futaba\* T6AS radio with Hobbico\* Command C-65 high-torque (77 oz.-in.) servos. We have used these servos on other projects and have been very pleased with their performance; they also have a heavy-duty helical gear train.

After mounting the U.S. Engines 41cc engine, a final CG check indicated that we needed to add some weight to the tail (probably due to the heavier gas engine on the nose). As a final touch, we used a Tru-Turn\* AT-6-type spinner and installed a Top Flite dummy radial engine and Top Flite full interior kit.

### FINAL THOUGHTS

Top Flite has done an exceptional job with the Gold Edition Stinson Reliant. The kit is outstanding and very well engineered. Building this kit was truly a pleasure, and we found only a few minor problems that were easy to correct. Don't be intimidated by the Stinson's size; it would be a great first giant-scale project.

We have both been building models for many years and have been building full-time for the last five years. It's very rare that a plane creates as much excitement at the field as the Top Flite Stinson did. The size, lines and graceful beauty of this Golden Age classic put it in a category of its own.

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ✦

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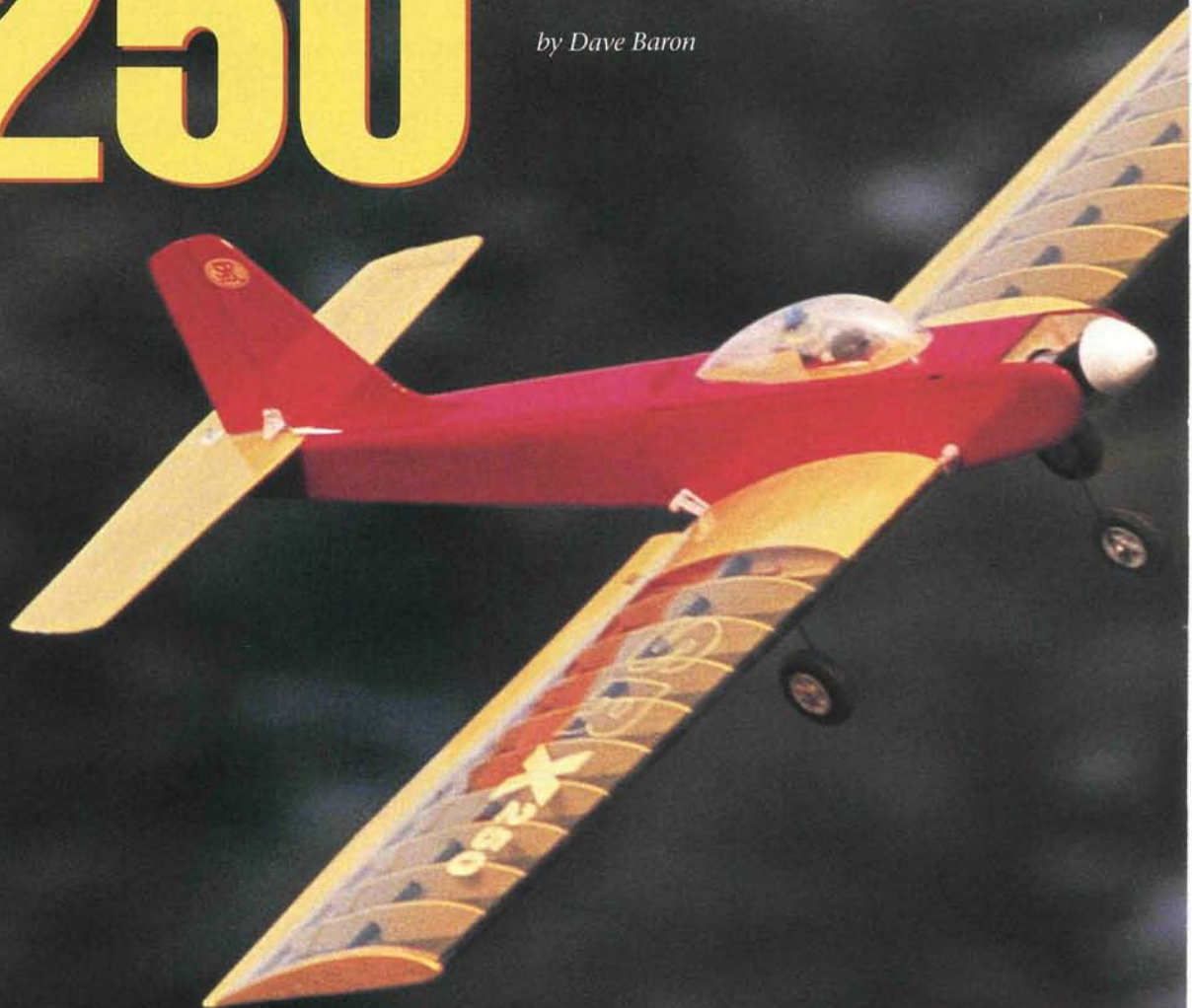


*An "X"-cellent Speed 400 package*

SR BATTERIES

# X250

*by Dave Baron*



## SPECIFICATIONS

**Model:** X250

**Manufacturer:** SR Batteries

**Type:** low wing sport-electric

**Wingspan:** 36 in.

**Chord:** 8 in.

**Wing area:** 260 sq. in.

**Wing loading:** 12 to 13 oz./sq. ft.

**Weight:** 20 to 24 oz.

**Power req'd:** 7.2V Speed 400

**Power used:** Graupner Speed 400 7.2V w/  
2.33:1 gearbox and Jeti 350 ESC

**Battery used:** SR 10-cell 500 Max  
(575mAh) pack (7.3A max static drain)

**Prop used:** Graupner 9x5 folding

**Radio req'd:** 4-channel

**List price:** \$79.95

**Features:** balsa construction with carbon  
spars; plastic canopy; color plans; 52-page,  
photo-illustrated construction manual;  
and complete hardware package, including  
wheels, landing gear, pushrods and  
clevises.

**Comments:** this is an awesome airplane; it  
outperforms every other sport Speed 400

plane that I have flown to date. It takes off  
from grass well, is playful and responsive  
and has great duration.

### Hits

- Well-thought-out design.
- Relaxing and easy to build.
- Great performance.

### Misses

- The sheet-balsa ailerons tend to flex; this  
is a natural consequence of the model's  
lightweight construction.



## FLIGHT PERFORMANCE

### • TAKEOFF AND LANDING

With its tricycle gear, the X250 takes off easily from grass fields, and it has a robust climb. On landing, the model has a fairly high sink rate but remains very controllable. It has an excellent flare and settles in nicely for landing, without floating to the ground.

### • GENERAL FLIGHT CHARACTERISTICS

The X250 has a speed range of about 15 to 35mph and has good, stable flight characteristics throughout its speed range. It can easily fly in tight areas.

At low speeds, the model stalls perfectly straight ahead and, even in tight turns, rarely shows a tendency to snap over. I find that it does this only when the ailerons are hard over at the break of the stall—not a surprise!

At high speeds and even with full elevator travel, this plane simply tries to fly through the stall without much loss of altitude. I attribute this quality to the gearbox and propeller combination.

With the SR 10-cell 500 Max (575mAh) pack, you can get 7 minutes of wild fun or up to 15 minutes of loafing along at reduced power.

### • AEROBATICS

This is what separates the X250 from other Speed 400 models. It truly can be played with. Low inverted: no-problem; snap-rolls, inside and outside spins: have a blast. Extended outside (inverted) maneuvers require all of your power due to the flat-bottom wing and the resulting high angle of attack necessary to sustain flight. The X250 will outside loop, but not with authority. I'm hoping that SR considers a more symmetrical wing rib for a future version of this model.

If you're looking for a classic design in a premium-quality kit, look no farther: the SR Batteries\* X250 is a pleasure to build and outperforms every other Speed 400 model I have ever flown.

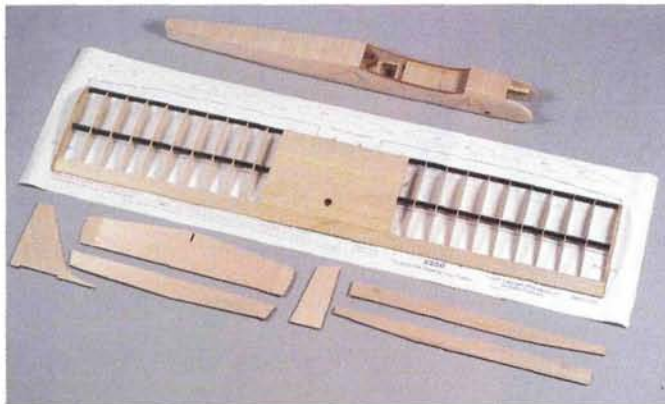
The X250 comes with laser-cut parts, color plans, high-quality wheels, pushrods, clevises, prebent landing-gear wires, graphics and a 52-page construction manual with detailed illustrations that are so good that you could probably build the model simply by looking at the photos! The laser-cut parts easily fall out of their sheets with a little nudge, and none were partially cut or over-burned. The balsa selection is also great—stiff in the right places.



### DOWN TO BUSINESS

The fuselage is built out of balsa and spruce ply. Virtually all of the spruce ply is laminated to the inside of the plane, so you won't hit any "hard parts" when you sand it. The top of the canopy is removable so you can quickly change the battery without taking off the wing. This is a well-thought-out system and also keeps





*The model shown is ready to cover; it's lightweight and strong.*

the battery away from the receiver and servos in event of a crash.

The kit is supplied with a P-51-style bubble canopy that's mounted to the hatch; the canopy virtually becomes the handle by which you hold the hatch! I mounted mine with RC-56 glue directly to the covering. If you elect to use a pilot, watch its weight; don't spoil the performance of a great model with a heavy, molded-rubber pilot! Look for molded-plastic characters. My favorites are the ones that fast-food restaurants give away with kids' meals.

The width of the fuselage is designed to perfectly accept the inexpensive Graupner\* 7.2V Speed 400 motor and 2.33:1 gearbox. This arrangement is very thoughtful and looks extremely durable.

The wing is made up around two carbon spars, one at the leading edge and one as a main spar. This means that breaking or folding this wing is highly unlikely. The ribs are balsa, and one of my only criticisms of this kit is that there are too many ribs. With each rib only weighing one or two grams, however, this isn't a serious issue.

Although the ailerons are conventional strip-type, the way they are mounted to the torque rods is a simple system that I've never seen before. Because the ailerons are made of sheet balsa, their thickness does not allow a torque rod to be imbedded into the sheeting,

The solution is plywood donuts that engage the wire rod and distribute the joint to enough of the sheeting to provide outstanding integrity and durability. They may add a little drag, but probably less than a control horn. I'm impressed with this simple solution.

Hinging is accomplished with the tape that SR provides in the kit. This system is perfect for this application.

The tail surfaces are all sheet balsa and are capped at the tips for strength. Again, the design is well-executed, and the parts fit is great.

and ribs. The finished model looks great.

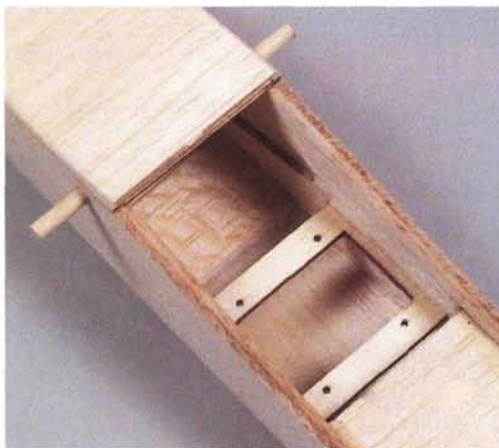
I used my JR\* 8103 transmitter for this review. I love this transmitter for its ease of programming and dependability. For the airborne RC components, I used a Hitec\* 555 receiver, Hitec HS-60 servos and a Jeti\* 350 speed control.

### PREFLIGHT CONSIDERATIONS

Because of the quality of the jigs in the construction of this model, warps in its structure were not an issue for me.

I found that I needed to position the receiver behind the servos to achieve the proper CG as shown on the plans. I mounted it to the wall of the fuselage side with hook-and-loop fastener and routed the antenna out through the opening in the tail.

Follow the instructions carefully when you adjust the control throws. I found



*Left: laser-cut servo tray. Right: access to the radio and battery is easy with the top hatch removed.*



### COVERING AND RADIO INSTALLATION

I covered the model with Goldberg\* Ultracote Lite. I knew that using a transparent material would show off the beauty and elegant simplicity of the carbon spars

that SR's recommendations are right on. The plane feels great in all axes.

### BUILDER'S COMMENTS

SR has taken kits to a new level with the X250. The precision of this kit is amazing. I was very impressed with the parts, color plans and all of the provided jigs and fixtures. The instructions are of impeccable quality: clearly written and precise. To sum up, I found the X250 to be the most relaxing model I've ever built.

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174.*



*I used an inexpensive Graupner 7.2V Speed 400 motor and a 2.33:1 gearbox to power the model.*







CERMARK SIGNATURE SERIES

# Pitts

## S-2B

by Rich Uravitch

**T**he basic Pitts design has been around for years; the construction materials have changed and the horsepower numbers keep rising, but the longevity of the airframe proves that it works, and the revered Pitts has gained a place in the hearts and minds of aerobatics enthusiasts. No surprise, then, that the airplane has found its way into a variety of kits, starting many moons ago with the Berkeley and Scientific control-line models up to one of the newest offerings, the Cermark® Signature Series S-2B Pitts ARF.

Designed by noted pattern flier Dave Patrick, this model follows the lead of the full-scale version and subscribes to the "minimum weight/maximum horsepower" school of aerobatic airframe design. The fuselage structure is mostly lite-ply with some birch

ply and balsa added where necessary. Extensive lightening techniques are employed in the manufacturing process, most evident in the fuselage sides where large open bays separate the former (bulkhead) locations. Surprisingly, you can actually look

quite clearly through the entire length of the fuselage from firewall to stabilizer. There is no structure except for that deemed necessary to absorb flight, power and maneuvering loads. Does that mean this Pitts is deli-

cate and flimsy? No; but it does mean that you shouldn't routinely drop it in from 10 feet on landing as you do your sport model! The Cermark Pitts is clearly as rugged as it needs to be to deliver the performance of which it's capable.

## FLIGHT PERFORMANCE

### • TAKEOFF AND LANDING

A gradual application of power had the model running straight, tail-high with almost no right rudder required to maintain heading. The built-in right thrust was clearly doing its job! After about 50 feet, the Pitts broke ground cleanly and maintained a very positive climb attitude while gaining speed. It

flew "hands off." Initial flights were flown with the control throws set for the recommended low values.

On landing, I set up a long downwind and turned onto final at just above idle power. A gentle headwind helped slow the Pitts down, but it still came past me at about 20 feet. Going to full idle allows it to slow slightly, but at no time did it display

any tendency to stall or fall off to either wing.

### • LOW-SPEED FLIGHT

It really is remarkable how slow you can get the Pitts; it doesn't have any tendency to drop a wing.

### • HIGH-SPEED FLIGHT

There are no appreciable trim changes



*Any way you cut it, the Pitts is a pretty airplane and a great performer.*





throughout the usable speed envelope of the Pitts, indicating that Dave Patrick got the force arrangements where they needed to be. Control response is naturally quicker at higher speeds but never gets mushy, even approaching the stall.

#### • AEROBATICS

Using high rate, rolls are quick, requiring just a touch of elevator to keep them axial.

Recovery from tumbles and similar "hot dog" maneuvers is instantaneous with no tendency to remain "hung up" or fight for recovery. It holds a knife-edge exceptionally well with just a touch of top rudder. There was no appreciable roll/yaw or pitch coupling evident; certainly no more than one would expect from a biplane of this type. It did show a slight tendency to go "toward the canopy" in knife-edge, but a touch of down-elevator made the

tendency disappear, and it really is a little too early to tell whether it's a characteristic, an occurrence, or a flying technique (probably the latter).

The Cermark Pitts is a very easy airplane to fly, and the only thing I recommend is more horsepower, such as a YS or 1.5 engine to help in the vertical with moves such as torque rolls. For all-around sport aerobatic flying, however, this package performs well.





## PITTS S-2B

### IN THE BOX

I must admit that I was impressed on opening the two boxes that the Pitts comes in. This 60-inch-span (IMAA-legal) Pitts is a good-size model, and the typical Pitts red with white-and-black-trim scheme is executed in a manner that most of us model builders couldn't match. To protect that neat Ultracote finish, all of the components are packaged in clear plastic sleeves. The fiberglass cowl and wheel pants, cabane system and interplane struts are pre-painted and come fairly close to matching the Ultracote. Reds are difficult to match perfectly, as I found out later when painting the aluminum landing gear, but the match on my kit was fairly good. The wings are completely built at the factory, so you need only hinge the ailerons and install the interplane struts.

### SPECIFICATIONS

**Model:** Pitts S-2B ARF

**Distributor:** Cermak

**Type:** scale aerobatic ARF

**Wingspan:** 60 in.

**Wing area:** 1,020 sq. in.

**Weight (review model):** 10 lb., 5 oz.

**Wing loading:** 23.3 oz./sq. ft.

**Engine req'd:** .90 to .120  
(2- or 4-stroke, 23cc gas)

**Engine used:** Magnum XL-120RFS

**Fuel:** Wildcat\* 10%

**Prop used:** APC 15x8

**Radio req'd:** 4-channel w/5 servos

**List price:** \$749.95

**Features:** lite-ply and balsa structure; fiberglass cowl and wheel pants and complete hardware package, including spinner, fuel tank, wheels and pull/pull control linkages.

**Comments:** a high-quality product that is well-designed, well-engineered and well-executed.

#### Hits

- Wing halves come joined.
- High-quality components and assembly.
- Ultracote covering and trim are well done.
- Nicely finished fiberglass cowl and wheel pants.
- Complete hardware package and high-quality accessories included.

#### Miss

- Instruction manual could be improved.

You'll be guided through the assembly sequence by a photo-illustrated manual that is, at best, adequate. Although you can use it to assemble the model, the manual could have been much more helpful and informative. For example, it takes nearly three pages (with photos) to tell you how to install an aileron servo, but the installation of the interplane strut connectors is covered by only one captioned photo. The I-strut connectors are metal fittings that you screw into predrilled and tapped holes in the upper and lower wings. Two of the holes on my kit were stripped, so I suggest that you "harden" all of them with thin Zap\* to beef up the threads. In addition, the holes were too tight to allow the strut-attaching screw to pass through; check them and drill them out if necessary; it's much easier now than after they're installed in the wings. Install



Throttle, rudder and elevator servos are mounted inverted into a tray under the hatch.

the top wing, make all the necessary adjustments to the strut connectors and struts—making certain you don't introduce a twist in the wings or change the incidence toward the tip—then secure the metal I-strut connectors with a drop of thin Zap on their threads. Mark the struts "L" and "R" so if you ever have to take the Pitts



The business end of the Cermak Pitts! The Magnum 120RFS 4-stroke engine swings a 15x8 APC prop at 8,300rpm with ease.

## Magnum XL-120RFS

Unlike some other large-displacement 4-strokes that use ABC innards, the Magnum is a ringed piston engine, so it requires a little different break in procedure and "feels" a bit different when new. Mine started (by hand!) on the third flip! All my modeling buddies and I were amazed. If you follow the recommended break-in procedures, this Magnum is likely to become one of your favorite engines. It runs flawlessly and responds to the throttle instantly. It seems happiest when being fired by an O.S.\* Series "F" 4-stroke glow plug.

I fly the Pitts with a 15x8 APC\* prop and, although still new, the engine turns 8,300rpm. The only thing I could fault the Magnum on is the instructions, which don't indicate which function is served by the fitting in the intake manifold, upstream of the carburetor. There's a similar fitting on the aft side of the front of the crankcase. Use a small piece of fuel line to connect the two fittings, as this arrangement allows for better lubrication of the bearings.

The supplied muffler is a two-piece unit, split and threaded around its center. Because the vibration can cause the two parts to unscrew and separate, I recommend that you apply thread-lock to the muffler parts and add a small machine screw to keep the parts together.

The length of the Pitts cowl and the relative engine position within it required that I build some sort of exhaust extension on the muffler. Mine consisted of a brass tube extension to which I silver-soldered a mounting/support bracket. The mass of pipe/muffler assembly needs to be "soft" mounted to absorb some of the vibration.



# MASTER AIRSCREW

The Price & Performance Leader



## G/F Series

These acclaimed sport props have greater thrust and lower noise, in sizes 5" thru 11" dia.



## K Series

Powerful 4-stroke props in 12" through 16"



## Classic Series

Scale props for large WWI & WWII airplanes in 9 sizes in 6" thru 20" dia.



## 3-Blade Series

New 9x7 for .40's!

Great scale look in now in 10 sizes: 9" thru 16" dia.



## Scimitar Series

Undercambered blades for more speed & thrust in 7" thru 14" diameters. Great for Electrics too!



## Wood Series

Sport props in wood, in 9" through 24" diameters



## Wood Scimitar Series

Undercambered maple blades for higher performance in 12" thru 24"



## Electric Wood Series

For electric only: wide undercambered blades for increased thrust; 8 sizes in 10" thru 13" dia.

**Windsor Propeller Co., Inc.**  
P.O. Box 250, Rancho Cordova,  
CA 95741-0250

## PITTS S-2B



completely apart, all of the settings will remain as they were.

Assembly progresses fairly quickly, as the kit includes nearly all the hardware required. You'll need only some Zap or epoxy to anchor the horizontal stabilizer and vertical fin and some more Zap for the hinges.

The kit comes with a beautiful aluminum spinner and backplate and numbered bags that contain all the hardware called out in the assembly steps. You won't have to buy much to complete your Pitts; 3-inch wheels, a 16-ounce



Interplane struts are prefinished plywood with blind nuts already installed. Socket-head screws make for easy disassembly when required.

fans. I decided on a Magnum\* XL-120RFS.



The aileron servos are attached directly to the hatch-opening access covers that are held in place with four screws.



The fiberglass wheel pant is securely attached to the formed aluminum landing gear with nuts and bolts through reinforcing plates. Wheels are included in the kit.

fuel tank, strips of hook-and-loop fastener and all necessary pull/pull cable control-linkage parts are included.

Five servos are required for the Pitts; one for each aileron and one each for throttle, rudder and elevator. I used a JR\* 6-channel XP642 radio with JR's low-profile, high-torque servos on the ailerons. Although the Pitts is not a huge model, it has fairly large flight-control surfaces that demand fairly torquey, high-resolution servos for precise control to deliver the style of aerobatics necessary. Don't skimp here; the model deserves it.

When it comes time to select a powerplant for the Pitts, a .90 to 1.20 2- or 4-stroke will fly the model. The instructions illustrate the installation of a YS .90 and 1.40 as well as a Zenoah G-23 for gas-burner

## FINAL THOUGHTS

Because no glassing, filling, or covering is required, you may spend 12 to 15 hours assembling your Pitts. You'll be impressed with the result, and so will the rest of the fliers at the field. And you know what? You probably couldn't build, finish and equip a similar kit-built

model for what this ARF costs.

When all has been assembled, installed and aligned, I recommend that you thoroughly check everything. Hinges secure? Linkages tight and slop-free? Engine and tank properly mounted? Cabane and interplane strut attachment complete? When you're satisfied that all these items are in working order, head for the field.

At the time of this writing, I have only had 12 flights on the model; hardly enough to completely evaluate its potential but more than enough to convince me that it is going to be among my favorite aerobatic models. The Cermak Pitts represents one of the better values in the growing world of ARFs.

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ★



# Hitec SKY SCOOTER

by Bob Aberle

*Editor's note: when Glen Merrit of Hitec RCD\* generously sent four extra Sky Scooters to the Model Airplane News office, it didn't take a lot of imagination to see that these stark-white foam models had a lot of potential to become Reno racers, jet fighters and other fanciful craft. We decided to have an inter-office contest to see who could come up with the best Sky Scooter scheme using water-based paint and stick-on trim and decals. With less than an hour of work, we came up with the simple schemes you see here.*

*If you'd like to dress up your Sky Scooter a bit, too, check out the official Sky Scooter Shootout contest on Hitec's website, [www.hitecrcd.com](http://www.hitecrcd.com). Hitec will award prizes to the most original designs. With very little time and effort, your Sky Scooter will look as good as it performs!*







*Debra Sharp, Chris Chianelli, Matt Boyd and Victoria Howell show off their designs.*



*Bob Aberle and the "stock" Sky Scooter.*

**A** new venture for Hitec, the Sky Scooter is essentially a ready-to-fly electric-powered model designed for beginners and packaged with the popular Hitec Focus 2 Single Stick AM RC system. The attractive street price of \$159 includes the aircraft, battery, battery charger and the RC system. The only thing you must buy separately is a set of eight alkaline AA batteries for the transmitter. Although designed for a beginner, this model features aileron and elevator control, making it of interest to more advanced pilots as well.



# SPECIFICATIONS

**Model:** Sky Scooter

**Manufacturer:** Hitec RCD Inc.

**Type:** electric RTF trainer

**Wingspan:** 32 in.

**Wing chord:** 12 in. at root, 5 in. at tip

**Wing area:** 276 sq. in.

**Wing loading:** 8.75 oz./sq. ft.

**Final weight:** 16.8 oz.

**Length:** 31 in.

**Radio:** Hitec Focus 2SS (included)

**Motor:** Speed 400 7.2V, w/3:1 gear reduction (included)

**Battery:** Sanyo 7-cell 300mAh (included)

**Prop:** 8½-inch diameter, 4- to 5-inch pitch folding prop (included)

**Street price:** \$159

**FEATURES:** foam construction; includes radio, receiver, sub-microservos (2),

Speed 400 motor, gearbox, propeller, Ni-Cd battery pack and charger, decals and instruction manual. The servos, RC gear, motor and gearbox come installed.

**COMMENTS:** everything about this model is designed to get you flying quickly and easily. The plane can be ready to fly in 15 minutes, and its stable flight characteristics are ideal for beginners.

## Hits

- Excellent overall quality.
- Excellent beginner flight characteristics even without motor control.
- Inexpensive.
- Very simple to understand and operate.

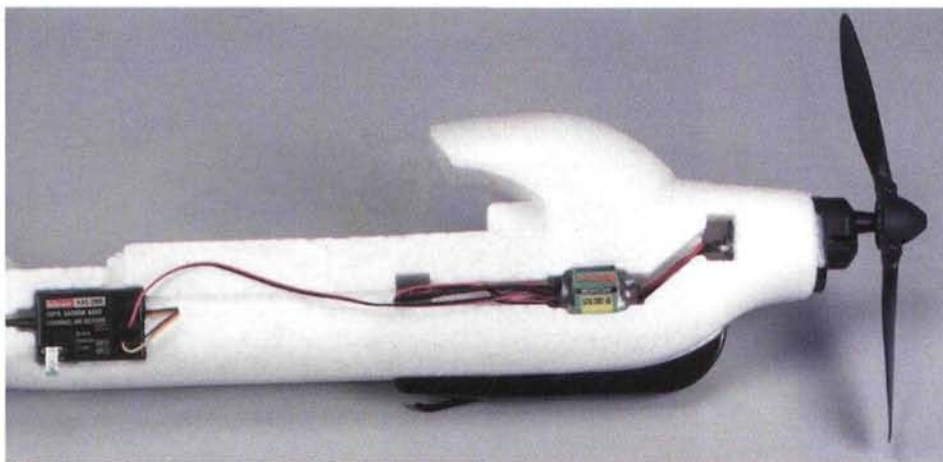
## Misses

- A peak-detect automatic battery charger would be easier for beginners to use with the included battery.

## ASSEMBLY

When Hitec says "ready-to-fly," it isn't kidding. The Sky Scooter is made entirely of EPP-derivative foam; it can absorb impact loads instead of breaking. In addition, you don't need any glue. The electric motor (a

7.2V Speed 400), a 3:1-ratio gear box with a folding prop and the RC system components all come installed in the model. Two Hitec sub-micro HS-55 Feather servos have been glued into cavities in the fuselage, and even the control surfaces come hinged!



*The receiver, motor, gear-reduction drive, prop and servos come mounted on the fuselage, so assembly is quick and simple. You can have the model ready for takeoff in less than 15 minutes.*



*The Sky Scooter is a true ready-to-fly kit: it includes the radio, battery pack and charger. All you need to supply are eight AA batteries for the radio transmitter.*

To complete the assembly, you only need to slip the stabilizer and elevator into a slot at the rear of the fuselage (a tight press-fit), then simply connect the prebent control rods to the ailerons and elevator, adjusting the clevises so that all surfaces are in their neutral positions. Next, insert the wing-rubber hold-down dowel (also a press-fit). Finally, paste on a series of decals to add some color. Total assembly time takes no more than 15 minutes, plus the time to apply the decals.

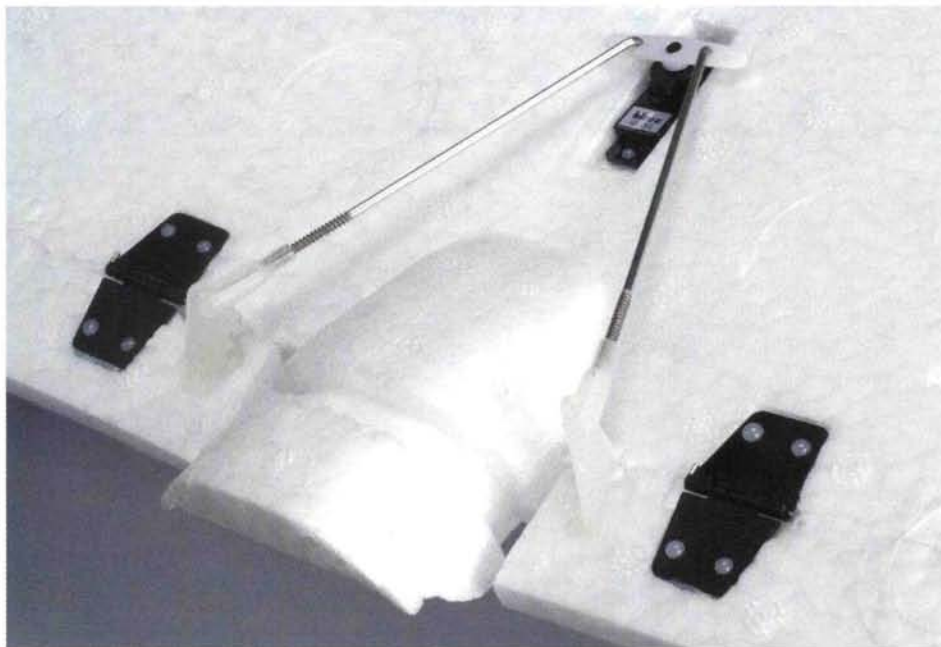
The Sky Scooter is based on the simple, inexpensive 2-channel Hitec Focus 2 radio. Although the model has aileron and elevator control, there is no motor control or throttle of any kind. After you've launched the Sky Scooter, you're committed to approximately 3 minutes of flight with the supplied 7-cell 300mAh Ni-Cd battery pack.

As the battery charge diminishes, the Sky Scooter will begin to settle in for a landing. On touchdown, a large plastic switch arm that's under the nose of the aircraft hits the ground, thereby shutting off the motor. With this neat "kill-switch" feature, the motor is never allowed to stall out under normal circumstances. For added protection, a 10A fuse is provided.

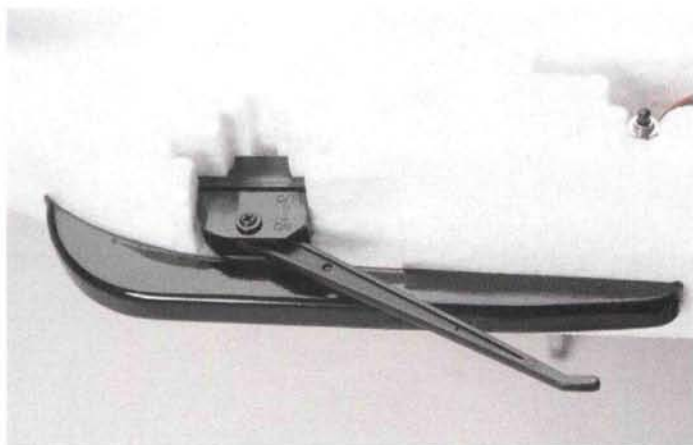
All of the radio components are readily accessible in the model. The 2-channel Hitec HAS-02MB AM receiver is press-fit into a molded cavity on the right side of the fuselage. Farther forward is a motor battery eliminator circuit and voltage-cutoff device that allows the battery to power both the motor and the RC system. I expect that the Sky Scooter will run out of flying power and land before the cutoff is activated, so it's really just extra protection. A rubber band holds the wing to the fuselage. The total flying weight of my Sky Scooter was 16.8 ounces. I calculated the wing area at 276 square inches, which equates to a wing loading of about 8.75 oz./sq. ft.

A timer-operated battery charger is included. The instructions tell you not to charge the battery for more than 15 minutes at a time, so be careful; the timer can be set all the way up to 30 minutes. A peak-detecting automatic battery charger would be easier for beginners; there would be no danger of over-charging. I measured the charger current at the start of a charge (battery fully depleted) at 2 amps. After 15 minutes, that charge current had dropped to 1.1 amps. A discharge test of the battery at that point indicated a capacity of 378mAh (more than the 300mAh capacity rating). Running the battery all the way down in flight will get it quite warm, so it is wise to let the battery cool off before you recharge it. To ensure plenty of flight





The control surfaces are prehinged and the control horns are mounted. Just snap the control rods onto the control horns, and you're ready to go!



The 2-channel radio controls the ailerons and elevator. There is no throttle, so Hitec installed this neat kill-switch under the nose; it turns the motor off on landing.

time, you may want to pick up a few extra battery packs.

The 5.6A motor current with the 300mAh battery pack only yields about 2¾ to 3 minutes of flight time, but since this model is intended for beginners, the designers felt that a 3-minute flight duration would be enough. The 300mAh battery pack only weighs 3.4 ounces, and I have already substituted a

7-cell, 500mAh pack that weighs 5 ounces. Motor current with that pack was 6.5A, and the flight time increased to about 4½ minutes. The additional 1.6 ounces of battery weight didn't affect the flight performance. Hitec will offer a 600mAh battery pack that should provide a solid 6-minute flight for intermediate level RC pilots.

## CONCLUSION

My experience with the Sky Scooter indicates that it is an excellent trainer. It is also quite resilient and should withstand hard landings quite well. If you've been looking for a sturdy, easy-to-fly model to introduce your children to RC, the Sky Scooter is a prime candidate for the job.

I really enjoyed testing this model. It behaves well and has no bad tendencies, and that makes it ideal for the beginner. Although the Sky Scooter is a capable trainer straight out of the box, I suspect some experienced RC electric pilots will enhance the Scooter's flight performance. Effective modifications might include: different gear reduction ratio (3:1 is supplied), prop diameter and pitch (the supplied prop is about an 8½ diameter by 4 or 5 pitch), or even a Speed 400 motor with a 6V winding.

Just as I was wrapping up this article, I learned of the new Pro Version of the Sky Scooter for the more advanced RC flyer. This system, which should be available by the time you read this, will come with a Hitec Focus 3 (3-channel) AM system and SP-1010 ESC, direct drive and a press-on Gunther white plastic prop. This version will also include a 600mAh battery pack.

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ✦

## FLIGHT PERFORMANCE

Before your first flight, check the CG; the model should balance about 4½ inches back from the wing leading edge. Control surface movement is also preset. The aileron wires connect to the inside holes on the servo output arm, while at the aileron end the clevises go to the second outermost holes on the control horns. The elevator uses the same hole on its control horn. Control surface movement is as follows: ¾ inch either side of the neutral position for the ailerons and ½ inch either side for the elevator.

### • TAKEOFF AND LANDING

Because there is no landing gear, all flights begin with a hand-launch. To save the fuselage bottom, I suggest you fly over grass, as opposed to pavement. Charge the battery and install it in the slot provided on the side of the fuselage. Turn on the transmitter power switch and pull down the "kill-switch" lever. At this point, the control surfaces will go to their neutral positions. Hold the transmitter in one hand. Press the motor-arming switch on the side of the fuselage, wait a second or two for the prop to come up to speed, and then

use your other hand to launch the Sky Scooter into the wind.

Beginners will quickly learn how to coordinate elevator and aileron controls at the same time. Although the Sky Scooter isn't terribly fast, it can easily gain 200 feet of altitude on a battery charge. As the charge wears down, you need to plan for your landing—try to line the model up toward the best open area at your flying field. Remember, without a speed control or a motor cutoff, you can't quit early on this model. You must fly it until the battery wears down; then and only then will it land.

### • AEROBATICS

I was able to do loops by first diving a little to gain extra speed. Despite all the aileron control throw, the Sky Scooter does not want to roll. But that same characteristic makes it very stable—the most important characteristic for a trainer.

Hitec has done an excellent job with this model. It has produced a plane that is easy for the beginner to handle yet fun for the experienced pilot.



by Don Edberg

# MULTIPLEX USA Cockpit

**T**he Multiplex Cockpit is one in a new line of RC systems that has recently been introduced in the U.S. by Multiplex USA\*, one of the world's prominent radio manufacturers. These unique new systems have some very interesting and useful features.

The Multiplex Cockpit is a full 7-channel computer radio system, but one of its more striking features is the shape of the transmitter, which is *much* thinner and flatter than what we're used to here in the States.



## 7 channels with a European flair

Along with this streamlined case is low weight: only about 22 ounces (600g). This makes extended flying sessions a pleasure because your arms don't get tired holding a heavy transmitter! (A typical transmitter weighs 60 percent—34 ounces—more!) There's also a neck-strap hook. A terse but detailed 48-page manual describes all of the Cockpit's functions.

The Cockpit contains programs for airplanes and helicopters. In addition to the usual centering, reversing and travel menus, the aircraft programming includes pre-programmed mixers for aileron→rudder (or rudder→aileron), aileron differential, V-tail, elevons, flaperon and spoileron and elevator compensation for throttle, flap and spoiler inputs. Helicopter functions include idle-up, autorotation, revo mixing and more.

Nine model memories are packed into this compact unit! Because of this flexibility, Multiplex USA will sell you precisely the components you want: trans-



*The Multiplex Cockpit is elegant yet simple to use. The clean case belies the fact that it's a full-function, 7-channel radio system. The Cockpit programming is done with the "3D" knob on the upper right; just turn the knob to get to the menu you want, then press the button to enter the menu. This radio also features electronic trims and an engine-kill switch.*

PHOTOS BY WALTER SIDAS



mitter only, transmitter and receiver, a full system with the servos you'd like; you name it!

### THE COCKPIT TRANSMITTER

The Cockpit system has seven channels: aileron, elevator, throttle and rudder are on the two sticks, and channels 5, 6 and 7 are controlled by the slide lever between the two sticks, the knob on the left, and the three-position switch on the right. The slide lever has a detent at its center position so you can easily find its position.

You can adjust the spring tension and length of the sticks and select the mode the transmitter operates in. The system also has a movable throttle ratchet. One really interesting feature is that you can independently select the stick mode for each model memory! This is handy when you have both conventional models and models with V-tails that are controlled by the right-hand stick (V-tail functions are usually split between the sticks).

The Cockpit also features digital trims. These move the trim location depending on which direction you click the trim switch (as if you were using the "scan" button on a car radio), as opposed to old-fashioned analog trims that you move directly with a trim lever and you have to remember. Each trim switch beeps when you press it, and there is a different sound when you reach center and each end of trim. Unlike other systems, the trims only move one increment each time you press the button, even if you hold it to one side. Trim memory stores the digital trim location for each model in memory, so you don't have to remember them!

Because there is a digital trim on the throttle channel, a momentary switch commands an "engine off" function that moves the throttle servo past its idle position to kill the engine. With this, you don't need to change trim to kill the engine, and the proper idle trim is always available.

The transmitter provides over three hours of continuous operation. Its 6-cell battery may take a little getting used to because we are used to seeing a higher voltage than the 7.5V shown (9.6V for an 8-cell pack)! You can adjust the voltage at which a low-battery warning alarm will sound (the adjustment range is 6.8 to 7.2 volts).

The system does not include a charger, but charge cords are included. Multiplex recommends that you use a quick-charger so that you don't overcharge the batteries by leaving them hooked up to a wall charger for too long.

The Cockpit provides several timing functions. A stopwatch tracks when a switch is flipped and can be programmed for up to 60 minutes. An operating hours timer can either keep track of total time or, as I prefer, time since last battery charge if it's reset after each charge.

### FREQUENCY CHANGING

The transmitter has a back case that you can quickly remove (just snap the two latches downward, then remove the back). You can change the stick and control functions by simply unplugging the wire leading to

*The Cockpit is slimmer and lighter than most other radio systems you'll see, meaning less fatigue in arms and shoulders after a flying session. The antenna may be removed and stored in the rear of the case.*



## SPECIFICATIONS

**Model:** Cockpit

**Manufacturer:** Multiplex USA

**Type:** 7-channel FM transmitter

**Battery included:** 7.2V 600mAh

**Weight:** 22 oz.

**Includes:** switch harness, transmitter and receiver battery charge cords, 48-page user manual.

**Price:** \$236 (transmitter only); \$410 (transmitter, three MS-X6 standard-size servos and IPD receiver); \$95 (IPD receiver alone); \$35 (crystal pair).

**Features:** unique 3D combination rotary/push-button knob for very easy and rapid data input and programming. Airplane special functions: differential ailerons, flaperons, elevons, V-tail, aileron→rudder or rudder→aileron mix, spoileron mix, flap→elevator mix, power→elevator mix, spoiler→elevator mix. Helicopter functions: idle-up, tail-rotor compensation (revo mix), autorotation switch, hovering pitch, tail-rotor offset, 3-point throttle and pitch curve.

### Hits

- Extremely light and comfortable-to-hold transmitter.
- Nine-model memory capacity.
- Electronic trims with beeps on four controls; engine-kill switch.
- Servo and travel functions: reversing, endpoints, dual rates, exponential.
- Rapid access to the inside of the transmitter for quick and legal frequency changes via plug-in crystals.
- Buddy-box system works with other Multiplex transmitters (trainer cable is \$20).
- No backup battery needed to maintain transmitter's model memory.

### Misses

- No freely programmable mixers.
- System does not include battery charger.
- Dual rates allow 0 percent settings, which could lead to loss of control.

## Multiplex IPD Receiver



The Multiplex Cockpit system I reviewed came with an Intelligent Pulse Decoding (IPD) receiver—yet another innovative product from the company that introduced PCM for radio control. This 1.1-ounce receiver combines the advantages of PPM (FM) receivers (a fast response to controls and compatibility with all PPM [FM] transmitters of from two to nine channels) with those PCM things that folks like (the receiver holds the position of the servos it was using before interference was received, and it can be programmed to move the servos to prescribed fail-safe positions if the interference continues solidly for more than half a second). If the transmitter is switched off, there is no servo jitter. This receiver seems to be the best of both worlds and is standard for Multiplex systems.

The fail-safe positions can be programmed using the diagnosis socket, which is like a direct-servo connect (DSC) cord used in other systems and allows the transmitter to move the servos without broadcasting.



## MULTIPLEX USA COCKPIT

the control and then replugging it into the desired function location.

Frequency changes are also a breeze; just remove the case back and swap your existing crystal with a replacement. This procedure isn't legal with other radios unless you're a certified radio technician, but Multiplex tells us that it has received permission from the FCC for owners to change transmitter crystals. This means expensive frequency modules are a thing of the past; all that's needed is a \$35 crystal pair on the desired frequency.

### PROGRAMMING FEATURES

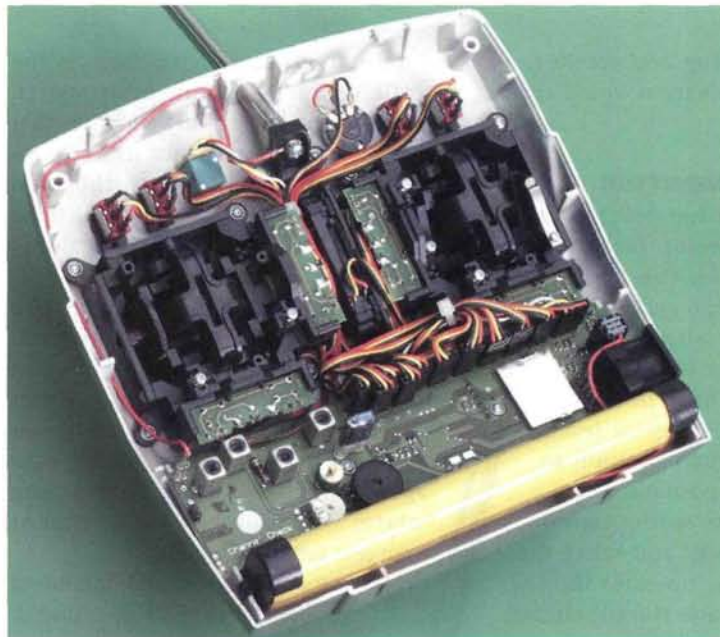
The Cockpit has all the usual computer radio features: servo reversing on all channels as well as centering and endpoint adjusting capabilities. Unlike the programming buttons on the Japanese imports, however, all inputs are handled by a 3D digi-adjuster knob just above the right-hand stick assembly. You move left and right through the programming menus by rotating the knob, and you go up and down by pressing it.



**The compact liquid-crystal display is used to monitor the programming and operating functions as well as battery voltage and timer functions.**

Programming data are input to the menus by pushing the knob (to enter a certain menu), then turning it (to enter a particular numerical value). Each of these actions is accompanied by a soft beep. Although this might sound complicated, it's actually very simple to operate and much quicker than the usual six or more push-buttons because you don't have to look for a particular button to press.

Data can be input into six main menus: Servo (neutrals and centering inputs), Model (select and copy a particular model memory), Mixing (turn special mixing functions on/off), D-rate (input dual rates and exponential values), Timer (set the alarm and stopwatch functions) and Setup (select the model type, e.g., air or heli, stick mode, trainer, etc.). A simple one-page flowchart is provided as a map of these functions, and navigation is easy with the 3D knob.



**By snapping two latches, the rear of the transmitter case can be easily removed by the owner, so he/she may easily switch frequencies by plugging in crystals (yes; it's FCC-legal with this system!). Multiplex recommends that you quick-charge the compact 6-cell/7.2V transmitter battery. No charger is supplied, but any 6-cell/RC charger will work fine.**

The Cockpit offers dual rate settings on aileron, elevator and rudder functions; all are switched on and off together (you can't switch on aileron dual rate with one switch and elevator with another switch). "Softer around neutral" exponential functions are also available on aileron, elevator and rudder. When these are activated, they are always on and cannot be switched off.

### SPECIAL MIXING FUNCTIONS

The Cockpit has both airplane and helicopter functions (it does not include any specialized glider mixing functions). You select the type of model in the Setup menu, where you choose either UNI (for "Universal") or HELI for helicopter. If you select UNI model, you may choose from the following functions:

- Delta wing mixer (links the aileron and elevator functions to drive elevon controls);
- Aileron differential function (this allows you to have the up-aileron go up more distance than the down-aileron goes down for more coordinated turns);
- Flaperon mixing, where both ailerons move together for flap function;
- Aileron→rudder mixer (can be changed to rudder→aileron if desired);
- V-tail mixer (combines elevator and rudder functions);
- Spoileron function (raises both ailerons and provides elevator trim to increase drag for steeper, more precise landing approaches—very handy for ducted-fan pilots);
- Power→elevator, flap→elevator, and spoiler→elevator compensation mixing (these three functions provide elevator motion to trim pitch changes caused by power, flap, or spoiler application, respectively).



If you select the HELI model type, the usual helicopter functions are activated:

- Autorotation switch (holds the throttle at low selectable value while pitch is changed for autorotations);
- Static tail-rotor mix (called "revolution mixing" in other radios);
- Idle-up;
- Throttle curve and pitch curve can be achieved by adjusting the center and endpoints, e.g., a 3-point setting.

The helicopter functions are not as extensive as those found in dedicated heli radios, but they provide enough for beginning- and intermediate-level pilots.

Within just a few minutes, I was able to navigate easily in the Cockpit's menu system and program all the features that I wanted. The screen display is simple and effective, and it's almost unnecessary to refer to the instruction book.

In short, the Multiplex Cockpit system offers a lot of nice features in an attractive, lightweight package. Check one out at your local hobby dealer; you won't be disappointed!

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. †*







## A compact, 22cc gasoline engine with drum-rotor rear induction

# RC SHOWCASE 140

by Gerry Yarrish

**T**he RCS 140 is a 22cc gasoline engine imported by RC Showcase\* (RCS). When I first saw the RCS 140, I was curious about this new, lightweight powerplant. From the outside, it looks and feels much the same as any glow engine you've seen before, but on closer inspection, the picture changes greatly. Here's what I found.

The engine's basic layout is very "model engine" in design. The case, cylinder and head are all made of cast aluminum, and the piston sleeve is made of steel. Twin ball bearings support the crankshaft, and an aluminum-shaft seal is between these bearings. The sleeve has an intake port, two bypass ports and the exhaust port cut into it, and they are nicely beveled to help smooth mixture transfer. A large intake port is also cut into the piston's skirt and aligns with the main port opposite to the exhaust port. Three transfer passages are cast into the cylinder housing's inner wall, and these line up with the passages cast into the crankcase's upper portion. The case, however, has four passages spaced 90 degrees apart. I suspect that this allows the same cylinder housing to be used for either a side- or rear-

exhaust engine configuration.

Eight bolts hold the top end of the engine to the case; four bolts hold the cylinder to the case, and four (spaced between the case bolts) hold the head in place. The head is a one-piece cast-

ing with a concave combustion-chamber roof (just like a glow engine.) The major difference here between glow and gas design is that the plug hole is drilled and tapped for a miniature NGK CM-6, 10x8.6mm (.339-in.) spark plug, not a glow plug. Head shims are not included with the engine, and there is no "squish band" taper around the combustion chamber.

The piston is ringed and has a recessed skirt that sets the timing and also clears the crankshaft's counterweight web at the bottom of the stroke. The connecting rod is machined aluminum

and has been milled to an I-beam cross-section to save weight. The top of the rod is bushed and has a good-size hole drilled into its end for proper lubrication, and the rod's lower end is equipped with a high-quality, German-made INA caged-roller bearing. The fit of the crankshaft, rod and piston assembly is virtually friction-free, and everything is very well made.

### LOWER END

As with the top end, the engine case is cast, and all internal surfaces have a high-quality, smooth finish; no machining flaws or stray shavings were left over from production. The threaded holes for the cylinder attachment bolts exit into the case cavity, but when I was disassembling the engine, I found that all these bolts were well-sealed with high-temperature sealant.

The most obvious feature of the engine is its rear intake design and the use of a

*The RCS 140 is a new, lightweight 22cc gasoline engine with a rear induction, drum-rotor intake.*



**Fully disassembled, the RCS engine shows its "for model airplane" design and layout. Parts fit is excellent.**



*A standard large-bore Walbro carburetor with choke was used on the test engine. Note the ball-link arms used for the throttle and choke. The ignition-sensor lead and connector are also shown.*



*Above: the connecting rod's lower end is equipped with a caged-roller bearing for almost friction-free operation. Right: the piston is ported and has a steel ring. The connecting rod is bushed at the top end, and a large lubrication hole has been drilled into it.*



drum-rotor induction valve. The "top hat"-shaped drum has a square opening cut into its side wall, and this matches up to the intake port cast into the engine's O-ring-sealed backplate. A hole in

the rotor's rim mates to a smaller extension on the crankshaft's crankpin. Rear induction engines have the added benefit of a very strong, solid crankshaft; on front intake designs, a large portion of the crankshaft is machined away to form the intake valve.

Another interesting feature is that the electronic ignition's Hall effect sensor passes through and is bonded to the backplate to match up with the timing magnet that's installed in the rim of the drum rotor. This arrangement cleans up the engine's front end nicely and makes it especially attractive to scale modelers who might want to put a dummy radial engine in front of the RCS 140 or install it into a tight-fitting cowl.

Bolted to the backplate and separated from it by a Teflon heat block is a standard Walbro pumper carb. The choke and throttle butterfly have been slightly modified with the addition of wheel collars and offset ball links; this makes throttle linkage setup very simple. As with all Walbros, there are two needle valves (for high and low speeds). In its stock configuration, a spring is installed on the throttle



*The engine case, cylinder, head and steel piston sleeve are well-made and fit together precisely. Four bolts hold the cylinder to the case, and an additional four bolts hold the head on top of the cylinder and sleeve.*

## SPECIFICATIONS

**Engine:** RCS 140  
**Distributed by:** RC Showcase  
**Displacement:** 22cc (1.4ci)  
**Weight:** 1.75 lb. (engine only)  
**Overall length:** 7.75 in. (case length: 3.25 in.)  
**Height:** 4.5 in.  
**Width:** 2.625 in.  
**Engine-mounting hole pattern (on centers):** 2.35 in. wide x 1 in. apart  
**Bore:** 1.221 in.  
**Stroke:** 1.150 in.  
**Prop-shaft diameter:** 8mm (.314 in.); 10mm shoulder bolt included  
**List price:** \$389 (includes ignition system); \$75 (inverted Pitts-style muffler)

**Comments:** available as either a side- or rear-exhaust engine, the RCS 140 is a gasoline engine that from the outside looks like a glow engine; it isn't a conversion but was designed from the start as a compact, gasoline powerplant. It is easy to start and adjust and comes with an automatic advance-timing ignition system. The engine also features a 10mm shoulder bolt for props with large bore holes, and it features a coned-shaped safety nut.

### Hits

- Excellent craftsmanship and materials.
- Compact size and light weight.
- Easy starting.
- Excellent power-to-weight ratio.

### Misses

- Engine-mounting tabs could be a bit wider.

butterfly; you should disengage it, but don't remove it. Leaving it on will keep outward tension on the shaft.

The Teflon heat block isolates the carb body from the hot engine case and has a small hole in it that matches up to the pulse-pressure hole in the carb body. If you remove the carb, make sure to reinstall the block so the holes line up.

At the front end, the prop-thrust washer is deeply knurled to provide excellent "bite" into the back of the propeller. The washer locks onto the prop shaft with a tapered brass collet, and the engine comes with an aluminum, cone-shaped, safety nut. Also included with the engine is a drilled and tapped shoulder bolt that you can use to increase the shaft's diameter from 8mm to 10mm.



## RC SHOWCASE 140

### IGNITION SYSTEM

The RCS 140 also comes with its own electronic ignition system featuring automatic advance-timing for easy starts. The module comes in a protective plastic case and runs on 4.5 to 6 volts. Several attractive features include a metal-braid shielded plug wire outfitted with a steel spark-plug boot cap, an easy to remove sensor lead and a small green LED power-indicator light. Also included is a power battery connector that you can attach to your own battery pack/switch harness.

An important note here is that even though the unit is rated for a maximum of 6 volts, you should not use a 5-cell battery pack unless you also use a voltage regulator. The ignition system cannot withstand more than 6 volts, and a freshly charged 5-cell pack can deliver slightly more than that. I chose to use a 5-cell, 1200mAh pack and a 5.2V Fromeco\* solid-state switch and voltage regulator. This system combines a voltage-regulator circuit with an on/off switch that uses a "pull pin" that you have to insert into a jack to turn the system off. A red "Remove Before Flight" tag attached to the pull pin makes it easy to see. Current drain seems very reasonable since after 25 minutes of test running, my battery pack was still at 90-percent capacity.



*I used this 5.2V Fromeco voltage regulator and on/off switch so I could use a 5-cell, 1200mAh pack to power the ignition system. Pulling the pin out arms the ignition system.*

### HOW DOES IT RUN?

I set up my test stand and ran the engine using several propellers. I used both composite and wood props, and I recorded engine rpm for each with a digital TNC\* tachometer. For each prop, I adjusted both the high- and low-end needles for maximum rpm and then backed off the mixture about 100 to 200rpm from max. I also used an RCS inverted Pitts-style muffler. As you can see from the chart, the numbers are very respectable, especially when you consider that the engine weighs a scant 1.75 pounds—not too bad for a 22cc gasoline-burning engine.

I started the engine using the standard "gas engine" procedure of turning on the ignition, closing the choke and fully opening the throttle. After half a dozen flips, the engine sputtered, letting me know that it had had enough prime. I then opened the choke and closed the throttle to about 1/4 and flipped the prop again. The engine



*The small pin extending from the crankpin drives the drum rotor. Note the sensor location in the backplate.*

*Here is the drum rotor in place in the O-ring-sealed backplate.*

started on the third blade!

With properly adjusted needles, the engine runs very smoothly. Only when you set the carb very rich or very

lean does the engine sound and feel rough. For all the props I tested, the idle was very close to the 2,000rpm range, and the engine is easily shut down by fully closing the throttle. You'll have to set your throttle-trim lever properly so you don't kill the engine with full back stick, but this is a good safety feature. Transition from idle to maximum rpm is typical for a gasoline-fed Walbro carb, and there is excellent high- and low-end performance, but a slight to moderate stumble occurs in the mid range when the mixture transfers from the low- to the high-end needles. If you have ever run a gas engine, you will find the RCS 140 very familiar to operate.

### FINAL THOUGHTS

Overall, I like the engine very much; it swings a wide variety of appropriately sized props and has excellent reliability. Its relatively low-compression ratio and advance-timing ignition system make hand-starts as well as electric starts with a standard 12V starter easy. The only thing I would have liked would have been wider engine-mounting tabs on both sides of the engine. As manufactured, their narrow purchase makes using standard metal-bracket engine mounts a bit tight because of the carb's location and size. I found that by bolting 1/8x1/2x2-inch-long aluminum plates to the engine tabs, I could use a 1.20-size Du-Bro\* isolation mount and have adequate room between the beams to clear the fuel lines and throttle linkage.

If you are in the market for a lightweight, reasonably priced 22cc gas engine, or if you are a scale modeler looking to switch from glow to gas, the RCS 140 is a good-looking prospect. I can't wait to put it in my Hangar 9 CAP 232.

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ✈

### RCS 140 PROPELLER/RPM RESULTS

	Prop	Size	Max Rpm	Idle Rpm
	Zinger	16x6/10	6,930	2,000
		15x6/10	8,260	2,200
	Master Airscrew			
	Simitar Profile (wood)	16x8	8,250	2,100
	Black Composite	16x6	8,800	1,900
	Composite (Classic)	16x10	7,950	1,900
		16x8	8,250	1,900
		16x6	8,670	1,850
	APC	16x6	8,350	2,000
		15x10	8,200	1,900
		15x8	8,450	1,900

Fuel mixture: 87-octane gasoline mixed 40:1 with Honda HP-2 2-stroke oil

Ambient temp: 81° F; barometric pressure: 30.19 in.; relative humidity: 89%



*Top: the engine test stand and several test props.*

*Above: the RCS was tested with the inverted Pitts-style muffler available from RCS.*

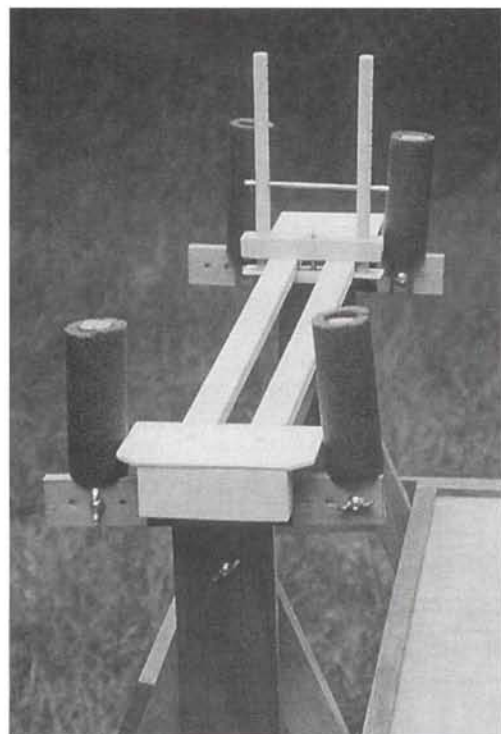


# Make a Small Model Support Stand

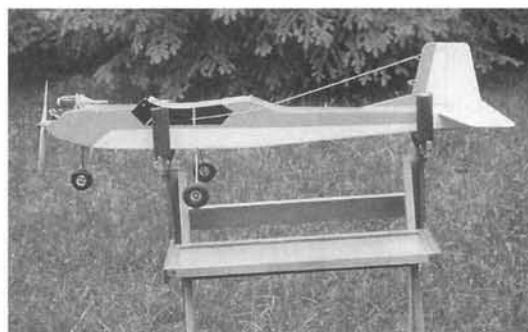
by Harry Braunlich

*Added security and safety*

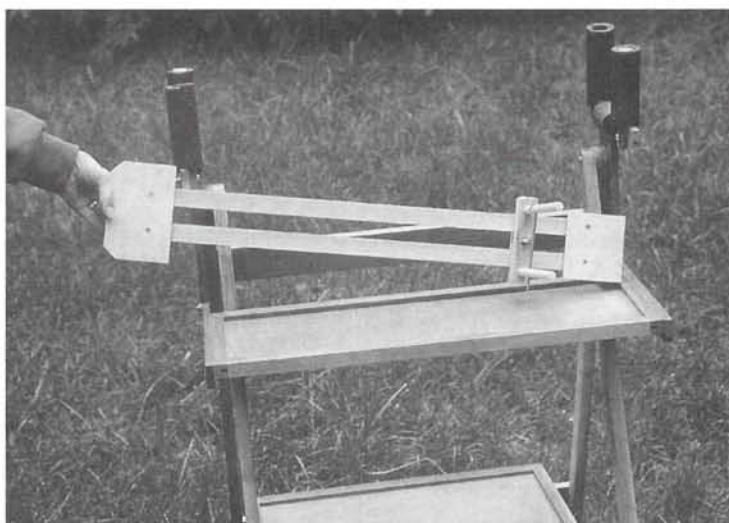
I always like to use an elevated stand when I work on my models; getting down on your hands and knees is uncomfortable, and starting your engine can be difficult if you don't have someone to assist you. Most of the stands you can buy are designed to support the average .40 to .60 sport model, and in this capacity, they work well. But what if you have a very small model? The answer I came up with is an easy-to-make, adjustable, model-support frame that fits into my model stand. Basically a stand within a stand, the support frame is made of wood and takes very little time and money to build.



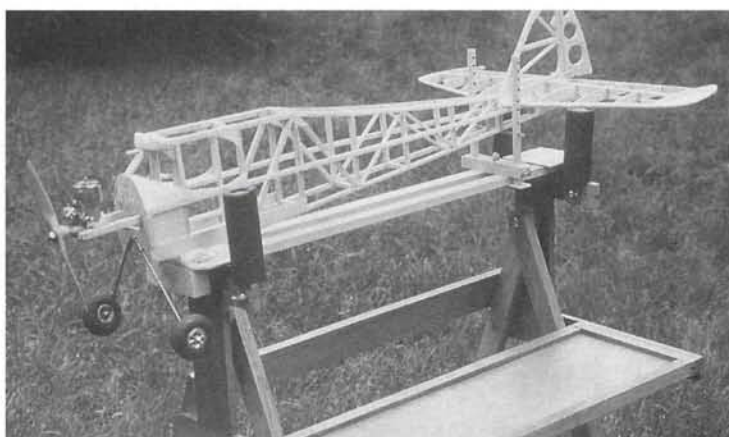
**This front view shows how the frame is supported in the model stand. The small block at the front prevents the frame from slipping backward in the support. The padded uprights hold the frame securely.**



**Above: my Bridi 40 trainer sits in the standard support stand. If your model is a lot shorter than the Bridi, you won't be able to use the stand to work on it.**



**Left: the top view of the lightweight, adjustable frame I use to support small models—very simple, yet effective.**



**Here, the frame safely supports my small, .15 Berkeley Brigadier. You can customize your frame to suit whichever small model you are working on.**

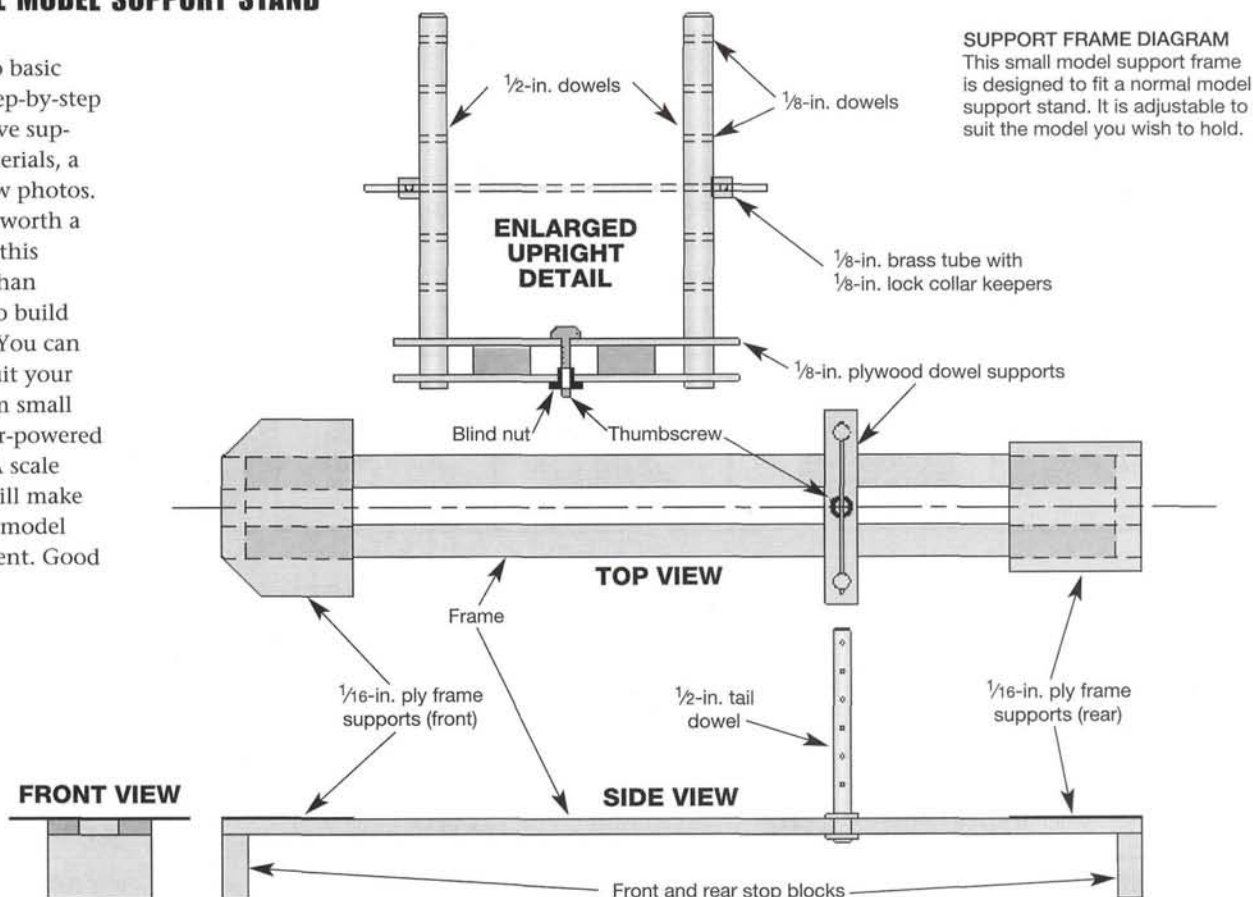
## MATERIALS

PART/PURPOSE	QUANTITY/MATERIAL
Frame	2—1/2x1x28-in. hardwood pieces
Front and rear supports	2—pieces of 1/16-in. plywood (4x4 and 5 1/2x4 in.)
Front and rear stops	2—hard balsa or hardwood blocks
Tail crosspiece support	1—1/8x6-in. brass tube
Tail dowels	2—1/2-in. dowels (length to suit)
Tail dowel supports	2—1/8x1x6-in. pieces of plywood
Frame lock	1—1/4x20x2 1/2-in. thumbscrew
Frame lock	1—1/4-20 blind nut
Frame assembly	4—countersunk wood screws



## MAKE A SMALL MODEL SUPPORT STAND

The frame is so basic that instead of step-by-step instructions, I have supplied a list of materials, a diagram and a few photos. Since a picture is worth a thousand words, this should be more than enough for you to build your own stand. You can customize it to suit your own models; from small electrics or rubber-powered free-flights to 1/2A scale jobs, the frame will make working on your model safe and convenient. Good luck. ✈



**SUPPORT FRAME DIAGRAM**  
This small model support frame is designed to fit a normal model support stand. It is adjustable to suit the model you wish to hold.

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## Servos enter the digital age

**D**igital servos have appeared in the last few years and offer significant performance improvements over older or analog servos. Futaba\*, JR\* and Multiplex\* currently offer digital servos; Hitec\* and some of the other manufacturers will soon be introducing their own models.

### CONVENTIONAL OR DIGITAL—WHAT'S THE DIFFERENCE?

Inside any servo, you will find both mechanical and electrical parts, among them, the motor, electronics, feedback potentiometer and gear train and case. All of these parts work together to make your servo move on command. The only difference between conventional and digital servos is how these parts work together and how fast they talk to one another.

To drive a load, the servo motor's rotation is geared down through a set of reduction gears to increase its torque and move the servo arm against a load. The servo's output gear, the thickest and slowest-turning gear, is at the far end of the gear train. The servo arm is attached to the output gear and moves the control surface on the model. It's important to know that the output gear is also physically connected to a potentiometer (often called the "pot")—a variable resistor whose resistance changes with the output gear's rotation so that it can sense the gear's position. Sensing that position is critical to the servo's performance.

The signal from the pot (the servo's position signal) is sent to the servo amplifier ("amp"), electronics that compare the commanded position signal (coming from the transmitter through the receiver) with the servo arm's actual position. If the arm is not where it's supposed to be, the amp sends power to the motor to move the output to the correct position. For protection and mounting, all of these parts are inside the servo case.

The operation of a servo is shown schematically in Figure 1. You can see the feedback loop—the key to accurate, high-speed servo motion. Feedback refers to the position of the servo arm, which is measured and fed back to the electronics

so that the proper command to move may be given.

OK; so what's the difference between conventional and digital servos? A digital servo contains a microprocessor (a tiny computer inside the servo). The addition of this microprocessor really improves performance. The German company Multiplex, whose products have recently become available in the U.S., was the first to incorporate computer technology into its mc/V2 line of servos.

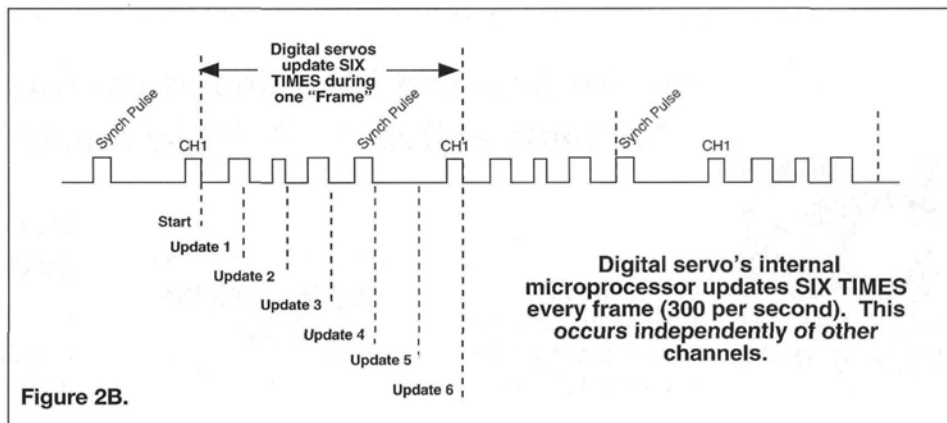
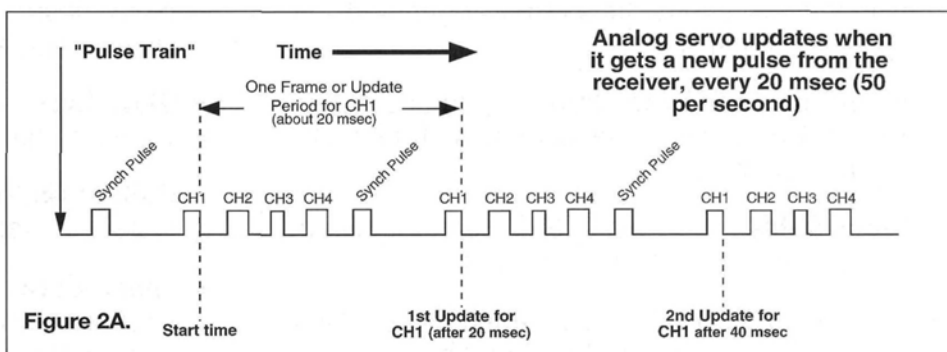
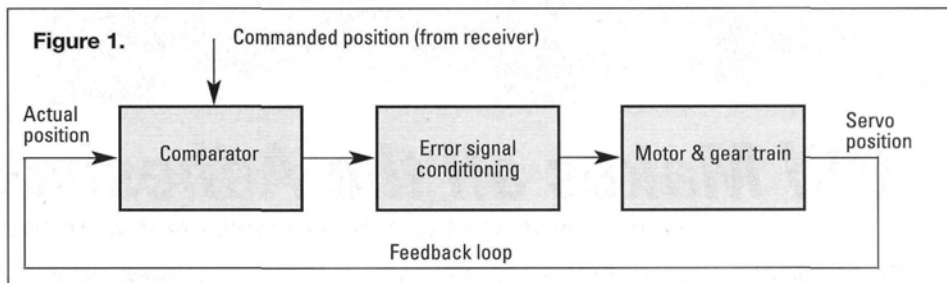
The microprocessor inside the servo can make a

### Advantages of digital servos

- Higher torque in a smaller servo.
- Better holding power at neutral.
- Higher update rate; responds to disturbances and control inputs faster for precision aerobatics.
- Interchangeable with conventional servos in most cases; no special receiver needed.
- Make a cool sound in operation!
- Some (Multiplex) may be programmed individually for neutral, travel, speed and fail-safe settings.

### Disadvantages of digital servos

- Higher cost compared with conventional servos.
- Some limitations to sizes and models available.
- Slightly increased current drain.
- Special unit required to program Multiplex servo.





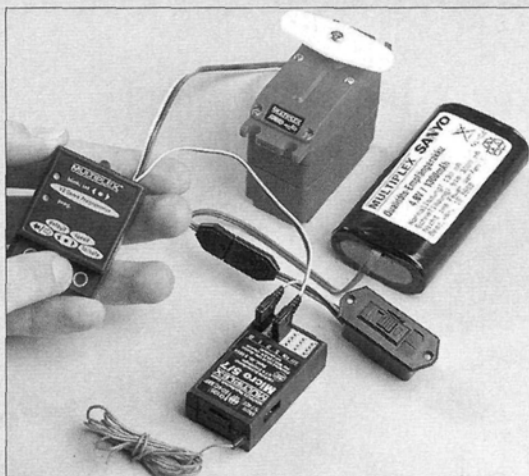
## Programmable Servos

Not only are some RC transmitters programmable, but Multiplex has also introduced the first family of servos in which the microprocessor that controls the servo can be programmed. This means that you can individually tailor each programmable servo to have various characteristics. These servos may be used for many different applications, from electrics and sailplanes to giant-scale aerobats.

Each of the Multiplex mc/V2 servos can be programmed to have any of the following characteristics:

- The servo's center position can be offset to any desired point.
- Adjustable endpoints for servo rotation: you can select throws up to 120 degrees of travel.
- Servo-reversing: the direction of servo rotation can be changed without removing the servo from the model or buying specialized reversing connectors.
- Adjustable servo transit speed (from fast to slow in six incremental steps).
- Programmable fail-safe position is a safety feature. The servo goes to a preprogrammed position if the signal is lost (on a non-PCM system, put this on throttle to cut throttle if there's interference to prevent your plane from flying away).

All these features are programmed using the Multiplex V2 Servo Programmer, a little, three-button black box that you plug in between the receiver and the servo. The servo programmer is portable, requires no batteries and costs about \$50. It can make life a lot easier—especially if you have a servo that's embedded in a wing or a fuselage that's really hard to remove and you need to reverse it or change the neutral position! These servos have been used successfully by a number of pilots on the U.S. teams who have won world championship events in RC soaring and car racing.



same length of time as a regular servo checks its position once. Therefore, you get a quicker response—as much as five times faster than you could get with a conventional servo.

This rapid-updating feature alone makes digital servos "strong": if you try to rotate one of these servos away from where it wants to be, because the servo scans so rapidly, it holds its position much more powerfully. This means that you can often use a smaller digital servo and still have good performance.

### DIGITAL SERVO HOLDING POWER—TORQUE

Servo torque performance is shown schematically in Figure 3, which shows a generic plot of digital and conventional servo holding torque versus the angle away from neutral. A conventional servo can't develop maximum torque until it has been displaced many degrees from its desired position. In contrast, note that the digital servo reaches the full value of its holding torque after a much smaller rotation of the servo arm. This is called holding torque, or holding power.

Because these servos scan so often, you will notice that they make a different sound compared with the conventional servos' buzzing when they are under load. The digital servos produce a higher pitch. A high-chopping-rate electronic speed controller makes a similar sound. Because they check so often, you will often notice a continuous high-pitched sound; this means that the digital servo is working hard to keep its control surface perfectly positioned.

You might think that all this extra scanning and power that's sent to the servo's motor would cause the current drain to be much larger than that of a conventional servo. Not so: the digital servos tend to drain only about 8 to 10 percent more current than their conventional counterparts.

Because the digital servo has a computer on board, you can use it to compensate for a bunch of factors that influence servo performance, for example, widely varying temperatures and component variations. This was impossible until the introduction of digital servos.

Some digital servos, particularly those

significant difference to the operation of the digital servo compared with that of the conventional one. The major difference is how often the servo checks to see its position and whether a correction is needed.

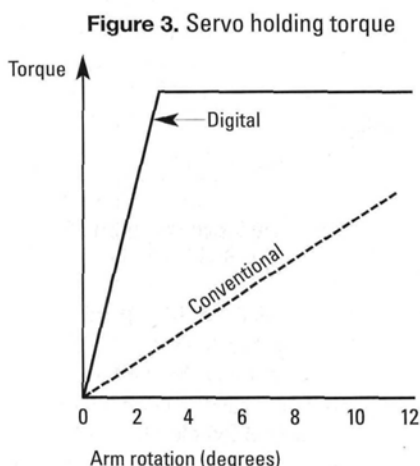
Conventional servos compare the actual and commanded position of their

servo arms each time a new pulse command is sent by the receiver (see Figure 2A). The pulses come as part of a frame of information that the transmitter sends to the receiver along with all of the channel information. These frames are generally sent about 40 to 50 times each second; the variation is due to the differences both among brands and the number of channels being transmitted.

A digital servo meters the position of the servo arm more frequently than a conventional servo can. All of the digital servos I looked at check the servo's position 300 times per second, about six times faster than conventional servos (Figure 2B). This means that the digital servo checks and tries to correct the servo-arm position six times in the



**The Multiplex Jumbo digital servo has 297 oz.-in. of torque for the ultimate in power.**





from Multiplex, allow you to individually program the servo for many factors, such as centering, travel amounts, rotation direction and transit speed. You use an external controller to modify these parameters (see "Programmable Servos" sidebar).

#### WHAT DO USERS THINK?

Everyone agrees that a plane loaded with digital servos flies more precisely, trims more solidly, tracks better and performs aerobatics better. The performance improves in every way.

The tighter stick tracking of digital elevator servos can be felt in a simple maneuver like a loop, in which the slipstream's pressure on the elevator changes. With digital servos, much less stick correction is needed to keep the loop round. Rolling circles require less

aileron stick correction to keep the roll rate constant. These characteristics are due to these servos' great holding power, so that the control surfaces can't move off stick position as much. Pilots say that after



**Intended for large models, JR's DS8411 digital servo packs 155 oz.-in. of torque.**

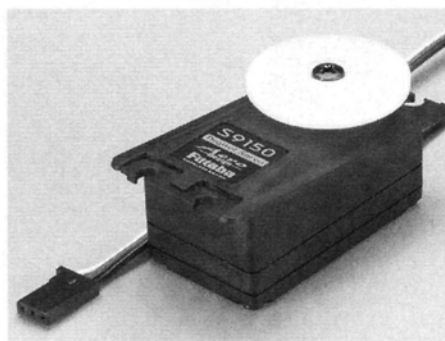
they've flown with the digital servos, the conventional ones feel like rubber in comparison.

Well, like everything else in life, you don't get something for nothing; digital servos cost significantly more than conventional ones.

Give one a try: you may find that the performance benefit is worth the extra cost—and you may not want to go back!

Remember, if you want to write to me, send a self-addressed,

stamped envelope to me c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 USA, or email me at man@airage.com. I get lots of mail, so please be patient!



**Futaba's 80 oz.-in. torque digital servo features a low-profile case.**

\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ✦

### Digital Servo Specifications

Mfr.	Servo	Torque (oz.-in.)	Speed (sec./60°)	Weight (oz.)	Size (in.)	Comments	Price
Futaba	S9150	80	0.18	1.87	1.90x1.06x1.00	Low-profile slanted case. Coreless motor. 2 BB.	\$140
Futaba	S9250	76	0.11	1.90	0.79x1.59x1.48	Air, heli. Coreless motor. 2 BB.	\$150
JR	DS8231	88	0.22	1.73	1.54x1.36x0.75†	High precision. Idle 11mA. Coreless motor. 2 BB. Pattern, jets, helis.	\$100
JR	DS8411	155	0.18	2.03	1.54x1.36x0.75†	High torque. Metal gears. Large scale planes. Coreless motor. 2 BB.	\$115
JR	DS8417	80	0.10	2.03	1.54x1.36x0.75†	High speed. Metal gears. Helis, 1.20 airplanes. Coreless motor. 2 BB.	\$115
Multiplex	Super FL mc/V2	42	0.15	0.85	1.61x1.67x0.43	Very thin for wing installation. 2 BB.	\$102
Multiplex	Micro Torque mc/V2	55	0.15	0.85	1.30x1.26x0.59	Install in wing or tail. 2 BB.	\$102
Multiplex	Micro Speed mc/V2	42	0.06	0.85	1.30x1.26x0.59	Install in wing or tail. 2 BB.	\$102
Multiplex	Royal mc/V2	78	0.11	1.60	1.57x1.61x0.83	Robust for helis. 2 BB.	\$84
Multiplex	Profi mc/V2	75	0.12	1.70	1.42x1.54x0.75	Universal for all models. Metal gear. 2 BB.	\$102
Multiplex	Profi Speed mc/V2	62	0.09	1.70	1.42x1.54x0.75	High-speed universal for all models. Metal gear. 2 BB.	\$102
Multiplex	Power mc/V2	135	0.19	2.90	1.85x1.85x0.91	For large models. 2 BB.	\$140
Multiplex	Jumbo mc/V2	297	0.20	5.70	2.36x2.36x1.18	Extreme power for special situations. 2 BB.	\$165

Futaba, JR and Multiplex servos all use 300 per second update rate.

†Same size as 4721, 4131, 531 and other JR standard-size servos.

BB = ball bearing.

Multiplex values measured for 5-cell/6V power supply; Multiplex holding power is three times torque listed.





## Cyber Komet and easy scale hinges

I have received a fair amount of mail from our "Scale Techniques" readers, and I thought it would be nice to relate a story that was inspired by the column. I'd like to encourage other readers to write in and share their scale techniques. Several readers have written to ask about my building-jig design that I showed in the October 2000 column; in it, I detailed the construction of my Ziroli Ercoupe. One writer stated that the jig supported his model so well during construction that he wondered why he hadn't thought of it before. Well, the truth be known: the building jig is not my original idea. I got the idea from my good friend

flights on the Komet and found the only difficult part was waiting for the takeoff dolly to drop off after the plane had become airborne.

Bob documented his model's construction with photos and even created a website to show the model's construction. You can check them out at <http://www.kolibri.lrtudelft.nl/people/student/fun/rob/163rc3.htm>.

Bob has since contacted modelers from around the world and has created a reference library about the Komet on his website. One of Bob's new contacts is Rob de Bie of the Netherlands, who is known for his research on the Me-163. Rob's listing of every article ever written about the Komet is linked to Bob's site.

The most eventful part of Bob's Komet venture came at the Warbirds Over Long Island event where he met Me-163 test pilot Rudy Opitz, who autographed the Komet's wing at the end of the day. To say Bob was thrilled would be an understatement. It is modelers such as Bob, Sal and Rob who team up to help one another that make this hobby so great.

*My new flying buddy, Bob Chubb, with his impressive Me-163 Komet. Bob has a website devoted to the Komet (see text for details).*

Chuck Gill, who owns and operates the kit-cutting company called The Aeroplane Works\*. Sometimes, a little idea can have great advantages, especially when it comes to building scale models.

### ME-163 KOMET

Since he was 14, Bob Chubb of Stowe, PA, had dreamt of building a scale Me-163 Komet. Bob had put his idea on the back burner until he read the April 1999 "Scale Techniques" column in which I discussed Sal Calvagna's Komet. The model is a Jim Kiehl-designed Komet that was built from a Joe Saitta kit.

Bob contacted me about the 163, and we later met at a flying event. I introduced Bob to Sal, and he was able to watch Sal fly his 82-inch, SuperTigre .90-powered model. Bob purchased the plans, the kit and formed-fiberglass parts and started building. He completed his Komet in six months and powered it with a SuperTigre G90 turning an APC 11x11 prop. On June 2, 2000, Bob teamed up with Sal and flew his Komet. Under Sal's tutelage, Bob put many

### FUNAERO GIANT SE-5A

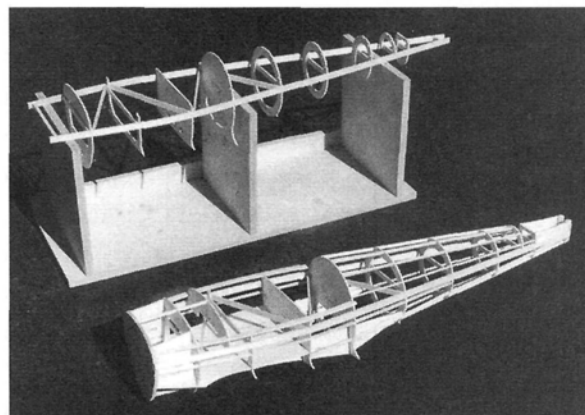
For those of you who love old biplanes, there is a new version of the popular Royal Aircraft Factory SE-5a. Produced in 1/4 scale, this British WW I fighter is from FunAero R/C\*, and I think it is going to be very popular. The SE-5a makes an ideal WW I model because of its long nose moment and large wing area. The FunAero version has an 80-inch wingspan and is a very complete balsa-and-plywood kit. All the parts are laser-cut, and the kit includes an impressive hardware package including a pull/pull cable system, a built-up plywood radiator (laser-cut), a removable plywood engine cover and scale exhaust stacks, to name just a few of its features.

The model's outline is very scale, but the wing airfoil has a flat bottom for easy flying; the company calls the kit a "sport" scale design but when the plane flies well, a flat-bottom wing doesn't bother me. Rigging wires are optional but would really dress up the finished plane. The airplane is designed for engines in the Zenoah G-38 range. The friendly people at FunAero R/C are available during the day to answer any questions you may have with regard to their product. Give 'em a call at (803) 499-5487, or check out their website at [www.funaero.com](http://www.funaero.com).

### SCALE MUFFLERS

As I was finishing my converted Midwest SNJ-2 (AT-6), I did not want to cut a big opening in the side of the engine cowl. I had little room for a muffler to fit between the engine and the cowl, but I did find that a J'Tec\* muffler fit nicely in the tight confines of the engine compartment.

The J'Tec muffler shown in the picture has a very thin profile and comes complete with a mounting plate and bolts for my O.S. 1.08 engine. Installation is easy. J'Tec is under new ownership, and the people there are working on a number of new ideas for mufflers. Al Young (J'Tec president) sent me a proto-



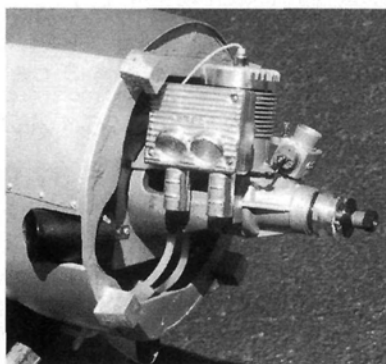
*The building jig I told you about in my last column was the brainchild of my good friend Chuck Gill. Jigs make it easy to build straight models.*





New from FunAero R/C, this 1/4-scale (80-inch) RAF SE-5a is a very impressive model. The kit includes excellent laser-cut parts and a lot of hardware. Plans are CAD-drawn, and the model is ideal for a Zenoah G-38.

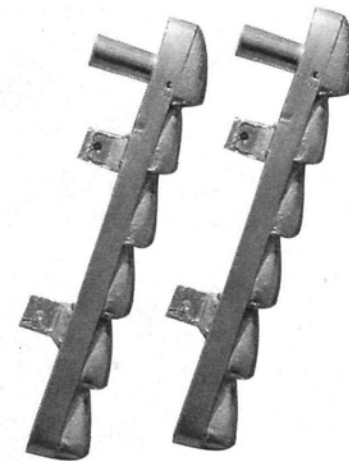
type of the company's new in-line exhaust system. As you can see, these exhausts can be used on a P-51 Mustang, a Spitfire, or an Me-109, where the externally mounted muffler would be both functional and authentic-looking. The aluminum casting of the prototype is very nice. The inner portion of the exhaust is connected to the engine's standard muffler outlet with a piece of neoprene tubing or a flexible metal tube. They will certainly weigh more than the decorative plastic stacks we have for many of these aircraft, but this should aid in balancing the aircraft.



*I hate cutting holes in scale cowls, don't you? To solve a tight muffler space problem with my Midwest SNJ-2, I used this thin profile J'Tec muffler.*

### ROBIN'S VIEW PRODUCTIONS

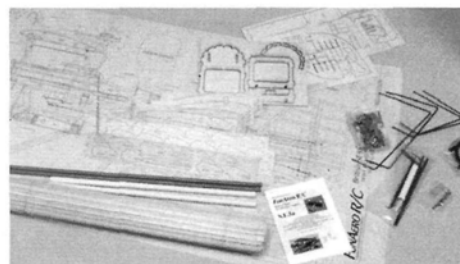
Having talked about foam wing construction many times in the column, I would like to mention a terrific new video available from Robin's View Productions\* called "Perfect Foam Wing Construc-



*Also from J'Tec are these impressive externally mounted mufflers that look like full-size exhaust stacks—perfect for a Mustang or Spitfire.*

tion." This tape shows general building techniques but offers much in-depth knowledge to add to your foam wing construction techniques.

Narrated by Bob Noll, the video shows how to make strong, light and accurately finished foam wings. I think the camera work is exceptional; you can see up close how to work with foam. If you'd like to learn more about accurate airframe alignment, try the "Perfect Airframe Alignment" video, also with Bob Noll. There is nothing like seeing the process to better understand how to build straight models.



*Here's just a small portion of the FunAero R/C SE-5a kit; impressive!*

### TECHNIQUE OF THE MONTH

Many scale modelers use commercially available hinges for their moving surfaces, and there are many excellent ones to choose from. This month, I'd like to share a technique with you for making scale-

looking T-hinges. T-hinges can be used almost everywhere, from the rudder and elevator to the ailerons and some flap installations. They offer good scale appearance and make finishing and painting your model a bit easier in the long run.

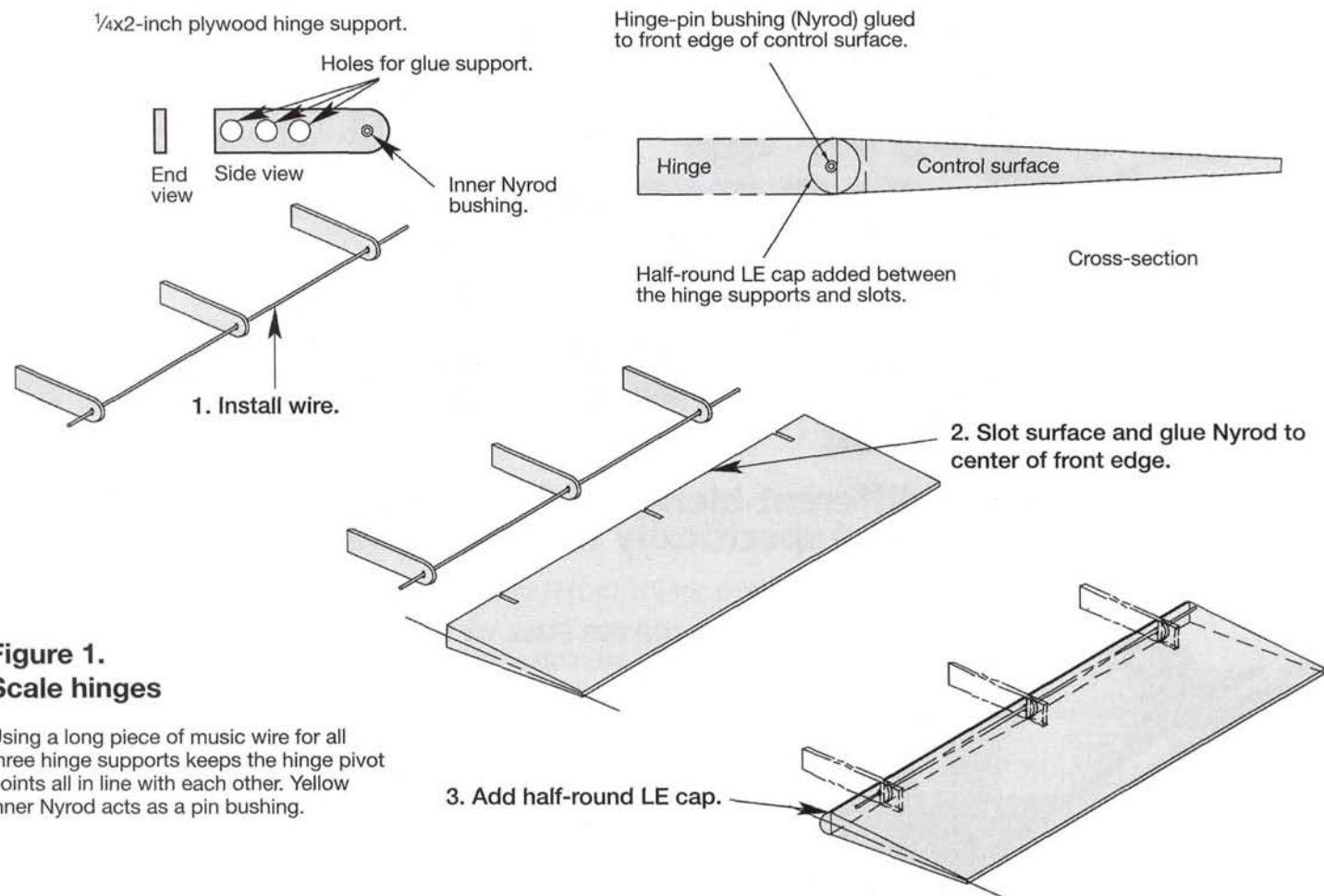
Using 1/8-inch plywood, cut three 1/4x2-inch-long pieces as shown in the illustration. Drill a 3/64-inch hole in the center of the piece, 1/4 inch from one end, then round off the plywood at the end with the hole. Insert a piece of yellow inner Nyrod tubing into the hole, and use a razor knife to cut the Nyrod flush with each side of the plywood. Make as many

hinge pieces as you need, then cut a piece of 1/16-inch music wire to the length needed to reach from the tip of your control surface to the innermost hinge. String the wire through the Nyrod bushings of each hinge.

Make your control surface about 1/2 inch shorter than its finished width so you can add the half-round LEs after installing the hinges. Cut 3/16-inch notches in the hinge locations along the straight front edge of the control surface. Center the music wire on the front edge, and slip the hinges into each hinge slot to make sure the slots are deep enough for the hinge to move freely. Now cut more Nyrod lengths and slip them onto the wire between the hinges. Reinstall the hinges and music wire, and tack-glue the long lengths of Nyrod to the front edge of the control surface.

Between the hinges, add a half-round





**Figure 1.**  
**Scale hinges**

Using a long piece of music wire for all three hinge supports keeps the hinge pivot points all in line with each other. Yellow inner Nyrod acts as a pin bushing.

balsa LE to "cap" the control surface. Sand and blend the LE into the top and bottom surfaces of the control surface. Last, cut matching slots in the TE of the mating surface for your control (the fin for the rudder and the horizontal stab for the elevators), and slide the hinges into place. Leave a  $\frac{1}{16}$ -inch gap between the TE and the LE, and you're ready to glue the hinges into place. After the glue has dried, you can slide the music wire out; the control surface will

come off, and the hinge centerlines will all be perfectly aligned with one another. Make a small, 90-degree bend in the end of the wire to make it easy to secure and remove. A small screw and a dab of silicone adhesive are all that's needed to secure the end of the wire.

To fill the space above the rounded LE, you can use a piece of  $\frac{1}{4}$ -inch plywood and glue it on top of the TE, then blend it in with some filler and sand it to shape. Give

it a try; it really is easy, and it looks great!

That's it for another month. As I've said before, please send in photos and information on your own special scale techniques, tips, or hints; I'll try to include them in the column. Write to "Scale Techniques," c/o *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

*\*Addresses are listed alphabetically in "Featured Manufacturers" on page 174. ✦*

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Actual Model Shown



# Astro Flight News

**Astro Flight Inc. Introduces five new and exciting products for the electric flyer: The new Mighty Micro 010 Brushless Motor for park flyers, a new Ducted Fan Brushless 05 Motor for the Kyosho T-33, FAI-035 and FAI-05 Planetary Motors for Sailplanes and two new surface mount digital speed controls.**

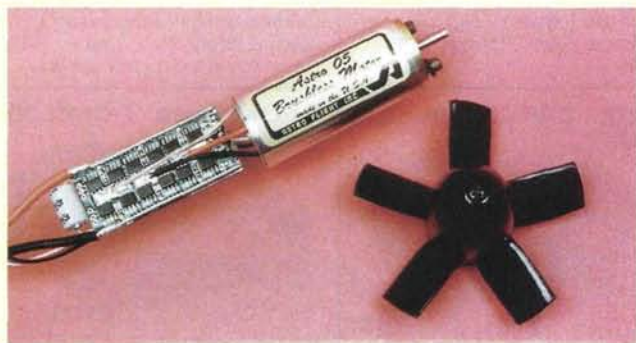
## The Mighty Micro is here!

Our new Mighty Micro Brushless 010 Motor #801 has arrived. The motor is one inch in diameter and one inch long and weighs only 35 grams with sensorless control. It spins an APC 6x2.8 prop at 9800 RPM while drawing only 2.5 amps from a six cell 350 mahr Nicad pack. Now you can fly for 5 minutes on Nicads, 10 minutes on Hydrides and one hour on lithium cells. The tiny On-Off Brushless control has Brakes and BEC. This system will work with 5 to 8 cell batteries. Perfect for models up to 10 oz.



## New Ducted Fan 05 Motor!

Our new 4 turn Brushless 05 Ducted Fan Motor #805F with 12 FET controller is specially designed to add Afterburner performance to the Kyosho T-33 and WE-Mo-Tek 480 ducted fan units. Run the T-33 fan on 8 or 9 Nicads or 10 Sanyo 3000 mahr Hydrides. The motor draws only 19 amps for 10 minute flights on Hydrides.



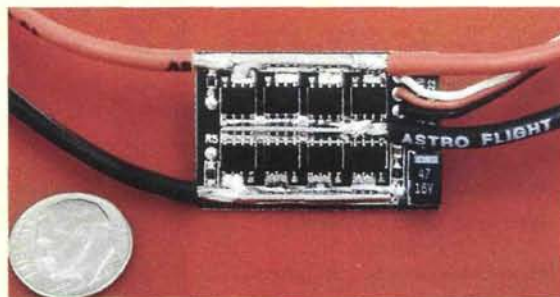
## FAI-035 with Planetary Gearbox

Our new 4.4:1 planetary gear box is now available for all Astro Cobalt 035, 05 and 15 motors. The FAI-035 with planetary gear box is perfect for 7 cell competition sailplanes. The FAI-05 with planetary gear box, shown here, is perfect for 10 cell sailplanes.



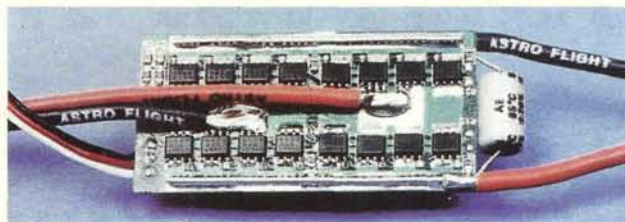
## New Astro 215D Airplane Control

The new Astro 215D Speed control uses new surface mount technology for minimum size and maximum performance. The tiny 215D weighs only 8 grams and has Brakes and BEC. It handles up to 30 amps and 10 cells. Perfect for Astro Cobalt 035, 05 and 15 motors.



## New 208D Reversing Control

The new 208D Reversing Control is designed for scale boats. It's 16 FET H-Bridge circuit gives you full power forward and reverse. The 208D weighs 1 oz and can handle 25 amps at 6 to 12 volts. It has a 2 amp BEC and a electronic current limit of 28 amps, so no fuses are needed. It was designed for tug boats and works great with 150 pound robots and electric powered blimps.



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Reports from readers around the world!

5TH ANNUAL

## Long Island Skyhawks' Scale Masters qualifier

**L**ong Island, NY, is an area with some of the richest aviation history in the country. Companies such as Curtiss, DE, Fairchild, Grumman, Republic, Seversky, Sikorsky and Sperry all started there. It is little wonder that scale modeling is also very popular on this long, thin strip of New York real estate.

For the past five years, Roy Vaillancourt and members of the Long Island Skyhawks club have hosted the Long Island Scale Masters Qualifier. Held in Eastport at the Skyhawks' flying field on August 12 to 13, it was also my first regional scale competition. At the meet, the top 30 percent of the Expert class qualified for the 2000 Scale Masters Championships in Dayton, OH. Trophies and prizes were also awarded in the Team and Sportsman classes.

The flying field is an impressive 350x900-foot grass runway in the middle of a 125-acre sod farm. Roy Vaillancourt was the

*Scale competitor and designer Dave Ribbe captured first place flying his Sofia turbine-powered MiG 15. Dave's MiG is the prototype for the popular Bob Violett Models kit.*



**Impound and registration tents.**

event's contest director (CD) and promoter; Nick Zirolì Jr. was assistant CD and prize committee chairman responsible for coordinating with event sponsors. The Skyhawks club has roughly 50 members and about half are involved in running the contest. An active scale-modeling club, the Skyhawks brought in outside judges to help smooth out and balance the contest; only five club members competed in the qualifier and



*Even though he had already qualified for the championships, Mike Barbee showed up to support the Long Island event. He flew his impressive 3W-powered, 1/3-scale Waco biplane to second place.*

**Send in your event coverage.** Mail photos, captions and text (500 words or less) to "Grassroots," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. Color slides and prints are acceptable.





*Long-time scale modeler and judge Cliff Tacie flew his well-executed Fly Baby to a third-place finish.*

went on to Dayton, and only one—Mike Gross—had qualified at the Long Island event. The others had qualified at either Top Gun or at the New England qualifier in Gardner, MA.

At the 1995 championships, Scale Masters founder Harris Lee asked Roy about starting another qualifier, and the Skyhawks began running one on Long Island. Early on, Roy, with the help of Nick Zirola Jr. and Tom Polapink, established scale judging seminars to train all the volunteer judges. These seminars are still held from time to time but not as often or as intensely as they were in the beginning. The club also runs a practice session a week or two before the qualifier to help the judges get into the swing of things and to go over any new rules that might be introduced at the meet. This high-level preparation certainly pays off. From radio impound and pilot registration to the static and flight judging, the Skyhawks' meets run very smoothly.

Scale Masters qualifiers differ slightly from AMA national scale competition in that no points are earned for strictly mechanical features. Functional details on the models, such



# Long Island Skyhawks Scale Masters Qualifier winners

## EXPERT

Place	Pilot	Aircraft
1	Dave Ribbe	MiG 15
3	Cliff Tacie	Fly Baby
4	Nick Zirola Sr.	P-38 Lightning
5	Peter Flanagan	Harvard Mk. 4
6	Jim Plucinsky	Hanriot HD-1
8	Mike Gross	RAF SE-5a
9	John Wood	Spacewalker
10	Earl F. Muenze	Fairchild M-62
Already qualified for championships		
2	Mike Barbee	Waco YMF-5
7	Robert Benson	T-34C Mentor

## SPECIAL AWARDS

High static	Jim Plucinsky
Technical achievement	Dave Ribbe
High flight score	Dave Ribbe
CD's determination	Dennis Hernandez



*Nick Zirola Sr. flew his ultra-reliable P-38 Lightning; he earned fourth place in Expert.*



*John Wood placed ninth in Expert with his version of Hazel Sig's Spacewalker.*

as operating flaps and retractable landing gear, are simply required if the full-size aircraft had them. Also, mechanical flight executions, such as bomb drops, tank drops, or flap deployment, must be combined with an appropriate flight maneuver—for example, a fuel-tank drop during a fly-past maneuver. Each flight round consists of five mandatory and five optional maneuvers. Mandatory maneuvers include takeoff, fly past, figure-8, landing and flight realism. Optional maneuvers include loop, roll, wingover, stall turn,

*Robert Benson (already qualified) flew his T-34C Mentor to seventh place.*



over-shoot (missed approach), descending 360-degree turn, procedure turn and traffic pattern, to name just a few. Each contestant's flight list must be presented to the judges before an official flight, and each maneuver must be executed in the order presented. The last maneuver (number 10) is always flight realism, and this is judged during the entire flight round, including when the contestant sets his

model up for a maneuver and during turn-arounds.

Three flight stations were set up at the qualifier, and considering the blustery and rainy weather, everyone was happy to have put in five flight rounds. Each contestant's final score was the average of his three best flight scores added to his model's static score.

**Tenth place went to Earl F. Muenze for this very nicely detailed Fairchild M-62. The highly modified model started as an IMP kit.**



**This beautifully detailed RAF SE-5a WW I biplane was flown by Mike Gross to eighth place. The G-38-powered vintage fighter is built from a Bob Holman plan. Mike qualified for the championships in Dayton, OH.**

As a first-time contestant, I learned a thing or two from the experience, but mostly I just had a great time. I am pleased with my 13th-place victory, especially when I consider the high caliber of my fellow competitors.

If you would like to learn more about the U.S. Scale Masters Association (USSMA) or would like to attend the Long Island Skyhawks' qualifier, visit the Scale Masters website at [www.scalemasters.org](http://www.scalemasters.org), or contact Roy Vaillancourt, USSMA East Coast vice chairman at (631) 732-4715. ✦

#### Long Island Skyhawks Scale Masters Qualifier sponsors

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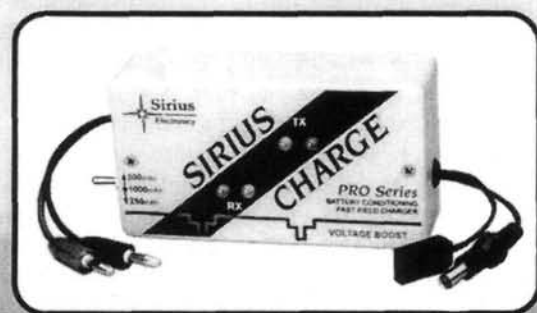
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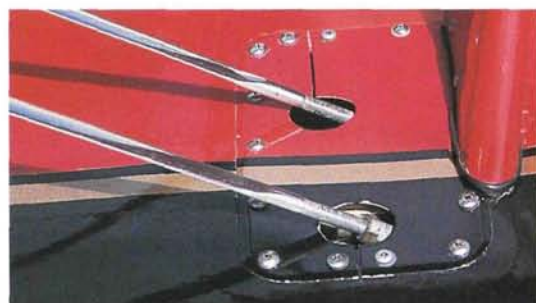




# PLANES WORTH MODELING

3-View Documentation for Scale Modelers *by Budd Davisson*

## Pitts Special S-2A



Above (left to right): note fixed trim tab on rudder and boost tab on elevator; cabane detail; rear cockpit layout. Far left: lower landing wire attachment point and cover plate; left: landing gear and brake detail.

## SPECIFICATIONS

**Span:** 20 ft.  
**Length:** 17 ft., 9 in.  
**Height:** 6 ft., 4.5 in.  
**Wing area:** 125 sq. ft.  
**Empty weight:** 1,000 lb.  
**Gross weight:** 1,500 lb.  
**G stressed:** 9Gs positive, 4.5Gs negative

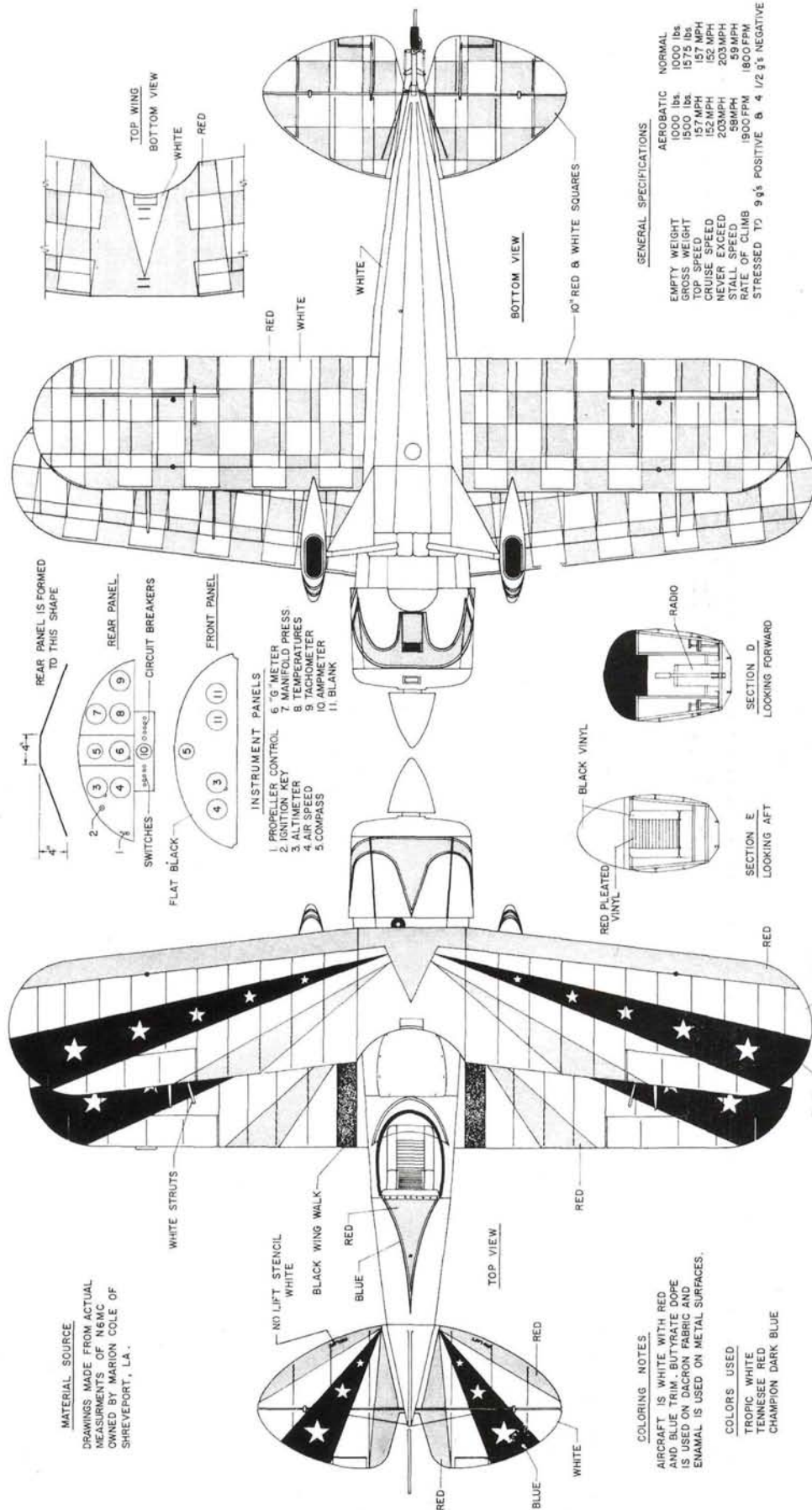
**B**ack in what seems like the dark ages of the late 1960s, American aerobatics was enjoying a rapid return to popularity. It had been a decade since Curtis Pitts yielded to pressure from wannabe builders of his little airplane—as made famous by Betty Skelton (Lil Stinker) and Caro Bayley (Black Magic)—and produced plans for the S-1C. Now anyone could build a hyper little jitterbug of an airplane and go out and burst blood vessels to his or her heart's content.

Midway through the decade, however, the World Aerobatic Contests began to show us that maybe we Americans didn't have the world as sewn up as we thought we did. The Eastern Bloc fliers, were routinely kicking our butts in



# MATERIAL SOURCE

DRAWINGS MADE FROM ACTUAL MEASUREMENTS OF NEMC OWNED BY MARION COLE OF SHREVEPORT, LA.

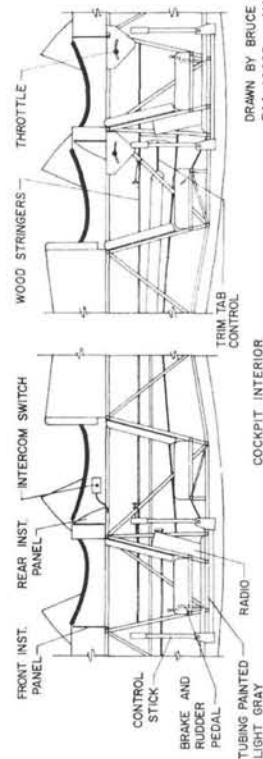
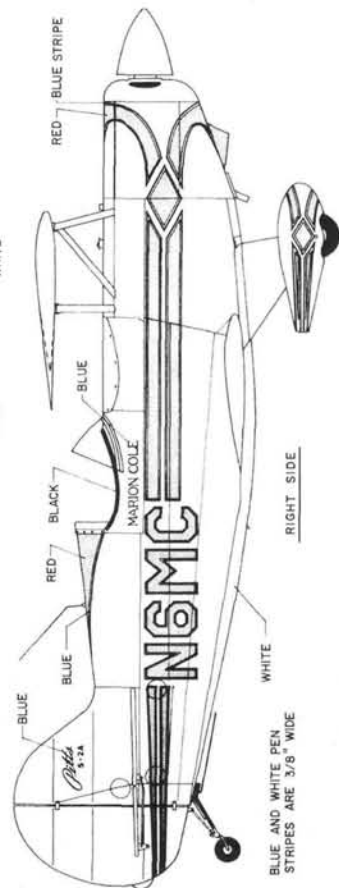


# COLORING NOTES

AIRCRAFT IS WHITE WITH RED AND BLUE TRIM. BUTYRATE DOPE IS USED ON DACRON FABRIC AND ENAMEL IS USED ON METAL SURFACES.

# COLORS USED

TROPIC WHITE  
 TENSEN RED  
 CHAMPION DARK BLUE



DRAWN BY BRUCE R. LUND  
 EAA 49823 AMA 57182

SCALE 1" = 1'-0"

DWG APPROVED BY

S-2A

*Pitco*



competition, partly because the Czech Zlins and Russian Yaks didn't know right-side up from upside-down. They did outside maneuvers much better than we could with our airplanes. So Curtis put symmetrical wings on the little S-1C, making it the S-1S, and we proceeded to do some butt-kicking of our own. We cleaned the world's clock in 1972 when the Pitts-mounted U.S. pilots took home gold for both the individual men's and women's titles, as well as for the men's and women's team trophies. The message was: don't mess around with a Pitts.

About this time, it became obvious that having superb single-place aerobatic airplanes had a drawback: there wasn't a two-place trainer with similar capabilities in which to train newbie akro pilots. So Curtis went back to his drawing board and came up with the Pitts S-2, a two-place, 20-foot span plane (S-1s all had less than 18 feet) powered by a 180hp Lycoming swinging a fixed-pitch prop. He used the same "round wing" technology as was used on the S-1S. He certified the airplane, eventually found partners and financing and put the airplane into production in Afton, WY.

The straight S-2 never went into production; instead, it was

modified to accept the 200hp IO-360 Lycoming and a constant-speed prop. This was the S-2A. The pure S-2 (a delightful, nimble little machine) lived on only as the S-2E factory-built kit.

The S-2A was produced for barely 10 years: 1971 to 1981, during which 272 airplanes were built before it was replaced by the 6-cylinder S-2B. Approximately one third of the airplanes went overseas immediately, and another third eventually fol-

lowed that first batch, which left around 80 of the airplanes in the U.S. A delightful little airplane with a definite karma, the S-2B has one of the most pleasing personalities of any airplane ever built. Many airplanes can now outperform it, but they almost always do so at the expense of handling.

Most S-2As cruise at about 135mph and have a redline dive speed of 204mph, which is almost never used, as the airplane doesn't need that kind of speed to perform. With a light load, 170mph gives plenty of oomph for a vertical roll with a hammerhead on the top, and it will outside loop from the bottom at 165mph with no effort.

With approximately 3,000 hours in the airplane, all I can say is, "Thanks, Curtis, for making such a wonderful addition to my life." ✈



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## Secrets to autorotation success

**W**elcome back! I hope that you have been practicing your forward flight and nose-in hovering because this month, we will cover autorotations. If you can accomplish forward flight, then you need to learn how to do autorotations. What are autorotations? If the engine quits in flight, an autorotation provides the means to safely land the heli (and they're a lot of fun to practice!). There are three phases to an autorotation: entry, descent and flare/landing. Let's take a closer look.

### THEORY

Before going out and doing autos, it's important to understand what an autorotation is and what happens during one. By the way, all full-scale helicopters can autorotate, and pilots must be proficient at this maneuver. During an autorotation, the heli loses altitude quickly to keep the main rotor spinning. During normal flight, the engine drives the main rotor blades, which have a positive angle of attack to provide lift down through the rotor disc. Without power, the rotor blades will stop spinning, *unless the blades*



*are moved to a negative angle of attack to direct airflow up through the rotor disc to drive the blade. This trades altitude for blade energy. Control is maintained as long as the blades turn at appropriate rpm. With proper energy management, aerobatics such as rolls, tumbles, flips and inverted descents during autorotations are possible (models only, please)!*

### SETTING UP

Before you practice autorotating, you should first check a few things on your heli. Adjust the collective pitch range to higher negative and positive settings than what's needed for normal hovering and forward flight. Activate the throttle hold

function in the radio, and—most important—make sure that the engine will idle reliably. Also make sure that when the engine is at idle, the clutch is not engaged (this would consume blade energy during an autorotation).

First, you will need 4 to 5 degrees of negative pitch on the blades for the descent. Either mechanically adjust the



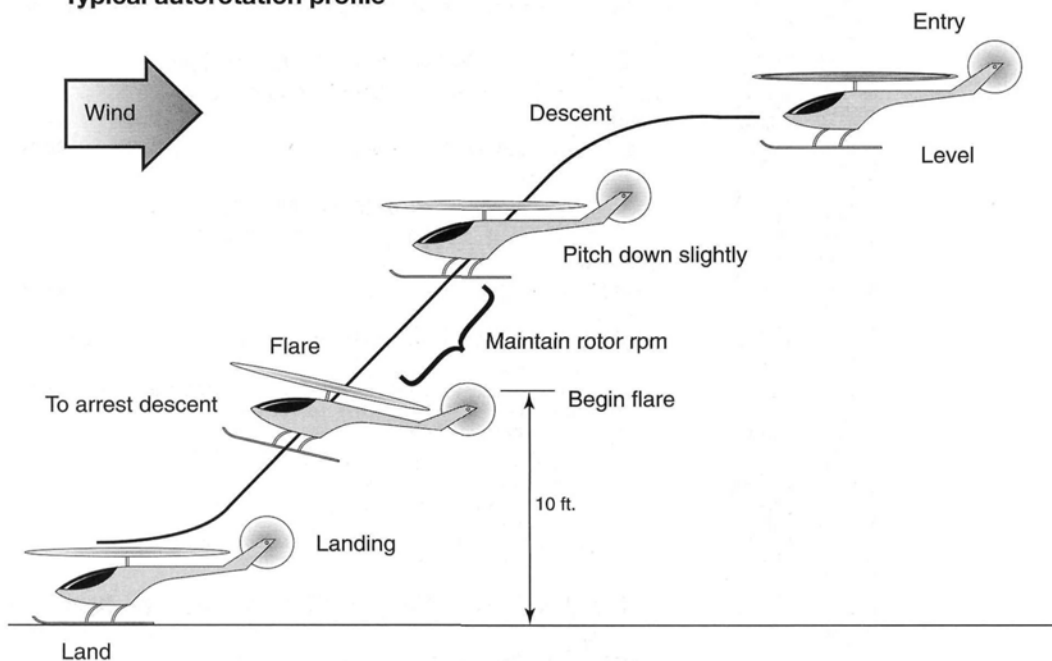
PHOTOS BY WALTER SIDAS

pitch or use the pitch curve in the radio program. Now adjust the top-end pitch to at least 10 degrees of positive; this is needed to flare and to stop the descent. Most modern radios have a separate pitch curve just for autorotations, so you won't have to compromise your forward-flight

pitch-curve settings.

Now adjust the throttle hold so that when you hit the switch, the engine goes to idle with the clutch disengaged. Follow the directions in the radio manual to do this. I start this process on the workbench, adjusting the throttle hold so that when I hit the switch, I can see the throttle servo go to the same position as idle in normal mode. I then make my final adjustments at the field with the engine running. Using this procedure, you won't have any surprises when you hit the throttle-hold switch for the first time.

### Typical autorotation profile

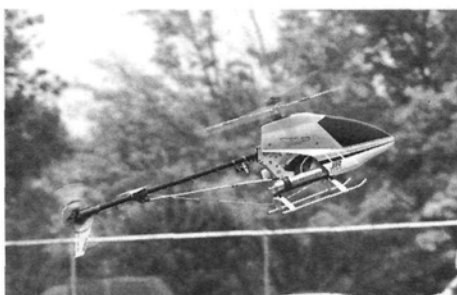




## TECHNIQUE

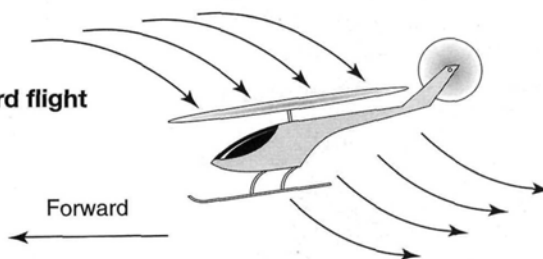
It's important to understand the sequence of events—entry, descent and flare/landing—and you should be comfortable flying circuits. During the descent, you'll be looking at the nose of the heli—another good reason to practice nose-in hovering. It's also good to have an experienced heli pilot do a few autorotations with your heli so that he can fine-tune the settings. I first learned autorotations by doing "hovering autos." From about a 2- to 3-foot altitude, hit the throttle-hold switch and land the heli, feeding in collective pitch for a soft touchdown. This accomplishes a few things: you'll become accustomed to using the throttle-hold switch and feeding in pitch at the bottom of an autorotation, and it will show you how quickly the blades bleed off energy. When you are comfortable doing hovering autorotations, let's take it upstairs.

Before doing full-down autorotations,

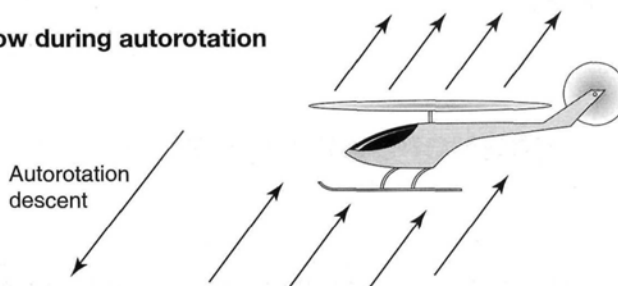


practice descending with your throttle trim at a low setting. With the heli sitting on the ground, move the throttle trim to the point at which the engine is idling but the clutch is not engaged (this is where your throttle hold should be set). Start by slowly flying the model into the wind, about 100 feet high. Your approach should be at a 45-degree angle. Now lower the collective pitch/throttle to its lowest setting. The heli will drop like a brick for a few feet, but as the airflow goes up through the rotor disc and picks up speed, the descent will stabilize and slow down. Push the heli's nose down as necessary to keep it moving forward while aiming it to a touchdown point about 6 to 7 feet past you. When the heli is at about a 20- to 30-foot altitude, flare the model by adding aft cyclic and collective pitch/throttle to stabilize into a hover. This will accustom you to flaring the model and stopping the descent. Keep practicing these descents, bringing them lower and lower until you

**Airflow in forward flight**



**Airflow during autorotation**



can stop and hover the heli over the spot where you want to land. This will let you get a feel for the heli in an auto descent, and it also allows you to "power out" of the descent, if necessary.

Now try make your descents steeper or shallower, and use more or less negative pitch to see how these factors influence the rate of descent. You'll be surprised how each of these can really change the autorotation descent.



Now that you can do power recoveries, it's time to do full-down autorotations. Just as before, start the autorotation by lowering the collective/throttle to its lowest setting then hitting the throttle-hold switch. If this feels uncomfortable, hit the hold switch and power out of the descent for a go-around. When the model is about 10 feet high, start your flare, and add collective pitch to stop the descent and forward velocity. Don't add too much pitch; if you do, you'll be sev-

eral feet high with no rotor rpm, and this will cause you to crash! When the heli is just past you, level it off by adding forward cyclic and increasing collective pitch for a soft touchdown.

At all costs, avoid touching down hard on the rear of the skids while pulling aft cyclic; this is the most common time for a boom strike during an autorotation. Remember to push the nose forward a little bit on touchdown. After all of this practice, a full-down autorotation should be anticlimactic but should still feel really good! The secret to autorotations is practice, practice, practice. You'll be amazed at how simple and how much fun doing autorotations can be. A great way to sharpen your skills is to tape a 3-foot-diameter circle on the field and try to land in it from an altitude of 200 to 300 feet!



More important, though, knowing how to do autorotations will save your heli if your engine stops while you're flying.

Remember, fly safely and with purpose! ✦



# NAME THAT PLANE

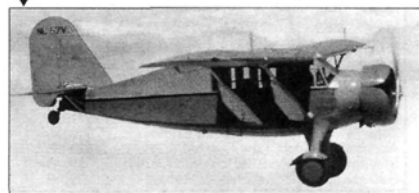
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Congratulations to Windsor Whittle of Memphis, TN, for correctly identifying our October 2000 mystery plane. Several people recognized it as a Bellanca Skyrocket, and a few guessed it was a Senior Skyrocket, but only Windsor pegged it as the Senior Skyrocket de Luxe. The Skyrocket series evolved from the Bellanca Pacemaker of the early 1930s, which for a time held the world non-refueling endurance record. The Senior Skyrocket de Luxe was powered by a 525hp Pratt & Whitney Wasp engine, had a wingspan of 50 feet, 6 inches, and could be configured to carry either five or seven passengers. Its finish made it look different from the standard Senior Skyrocket, while internally, the de Luxe featured revised avionics. ✚



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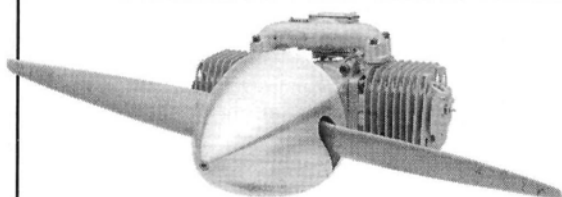


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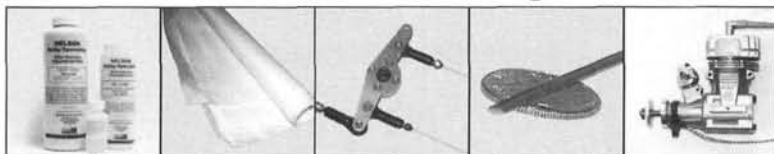
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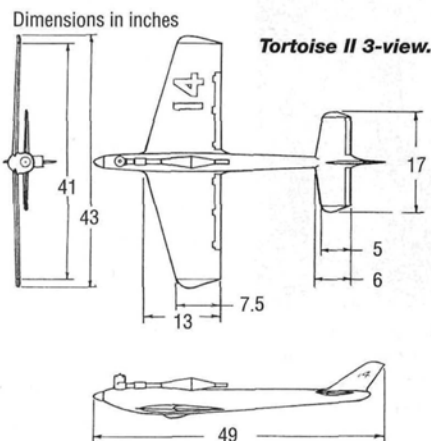
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Continued from page 178

methods set up by the event director could easily have added another 20 percent error in favor of the pilot ... but that's another story. They didn't cheat; they simply used loopholes to their advantage. Tradition holds that if the competitor's national aeroclub certifies a record, then the FAI will not deny it. So the 213mph record was certified, and then the FAI locked the barn door after the horse had been stolen by imposing super-rigid timing good to 1/100 second for straightaway records! Automated systems and sophisticated equipment far beyond the reach of modelers are now required. As far as I know, no one has figured out how to meet these rules since they were put on the books.

It took about 3hp to make Tortoise go 175mph. To make the comparably sized Soviet model go 213mph, those guys would have had to get 11hp out of their

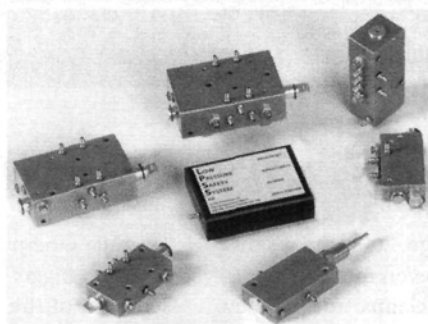


1969 vintage SuperTigre .60. You can get the equivalent of horsepower by diving into the straight-line course from a high altitude; I've tried that, and I've also tried flywheels on the prop. I think the best you can do using these tactics is about 2hp. Beyond that, the diving prop becomes drag—even though it may be spinning at 25,000rpm.

I don't believe there's a speed genius in the whole world who is capable of getting 9hp out of a 10cc engine. You may bust a lot of models, but I don't think you'll beat the stolen horse. So, better you should try to beat the 150mph record with a pylon racer on the closed racetrack.

If you are serious about breaking the speed record, I'll be glad to help all I can. Write to me at 2001 Norvale Rd., Silver Spring, MD 20906. ✚

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## '84 speed record still stands

**R**C pylon racers do 170mph! Fan jets go 200mph! Giant-scale racers do 220! Turbine jets can do even more!

Is this just hangar talk, or are these claims true? If they are true, why hasn't the world speed record of 150.1mph—set by a model called "Tortoise" 16 years ago—been beaten?

I've published articles on almost all of the 23 world records I've set in the past four decades, but I suspect it will be news to a lot of modelers that the world speed record is "only" 150mph.

On November 28, 1984, John Patton as contest director and I as pilot successfully flew that tiny model around the 800m closed course in a record time of 11.91 seconds. We went out three days in a row with a huge crew of officials before we achieved a circuit without any pylon cuts and with measured times that met the FAI rule: two watches must agree to within  $\frac{1}{50}$  second.

That may be the first reason that the record still stands. The FAI rule on this is senseless. One-fiftieth second is  $\frac{1}{10}$  percent of the measured time. One—or even two—percent should be sufficient precision for a record. Two people in front of a simple signal arm won't match to within  $\frac{1}{50}$  second more than about 10 times out of 100. The problem is worse with a model over a sight line.

Ah, well ... a rule is a rule! Pylon cuts and unmatched watches voided many, many circuits in the three-day trial. We eventually lucked out, getting around the pylons with no cuts with two watches that read exactly the same: 11.91 seconds.

Why else is this record so hard to beat? The rules limit engine size to 10cc, 0.61ci. This rules out giant-scale racers, turbine jets and a lot of swishy fan jets that use larger engines. Q40s or leftover Formula One racers are perhaps the best bet, but I don't think they go fast enough to beat Tortoise.

I can hear the speed experts shouting, "What? How can you say that?"

Well, let's look at the basics. The FAI closed speed course consists of four pylons on the corners of a square. Each leg of the square is 200 meters long. Only one circuit is required to set a record. The pilot can have turn callers with flags, radios, etc., but it is still hard to fly the course without cutting a pylon or traveling past them. The difficulty with depth perception is worse than it is on a pylon course where the pilot is close to two of the three markers.

So, 11.91 seconds for 800 meters computes to only 150.1mph. But after much study of the data for nearly 75 passes, I concluded that the distance flown on the winning circuit was about 950 meters, and the model's airspeed was between 175 and 180mph.

The 3-view shows that this model was a little smaller than

Formula One pylon racers and, at 420 square inches of wing area, just a bit bigger than Q40s. The engine was an OPS .60, a top-rated screamer of the '80s. There was no cowl around the engine, but it was fitted with a tuned pipe. The wing was only 9-percent thick. I strove for a small frontal area. Drag for drag, I estimate Tortoise matched a polished pylon racer. (Trust me; no coefficient gibberish will be included here.) I used a Top Flite or Grish Brothers maple 10x12 prop—a favorite of the control-line speedsters of the day. We used 40-percent-nitromethane fuel. When the pipe worked right, the prop turned about 21,000rpm in the air. The pipe didn't always work right; it was pretty tricky to throttle down between passes. We usually made five circuits on each flight but had to slow down and circle overhead between attempts to allow timers and judges to get ready for the next pass. It was wild, wild fun! The crew all agreed we'd break either the record or the

model before calling it quits!

What about using a pylon racer to beat this record? Well, Rich Verano holds the U.S. AMA record for Formula One pylon racers with 10 laps in 59.7 seconds—150.7mph—in 1994. In 1999, Tom Scott set the current record for Q40 racers at 59.8 seconds—150.5 mph—in Bowie, MD. Using



**A large crew was needed to run the closed-course speed trials. Most were DC/RC members. Author Maynard Hill holds Tortoise (no. 14), a model he designed and built to set the speed record. Paul Kirsch holds a small delta, called the "Hare," that was also designed and built by the author. It was faster on the straightaway but was beaten by Tortoise because the delta couldn't tightly navigate the course.**

the measured length of 2.5 miles for 10 laps, these values are nearly identical to Tortoise's record.

I am sure both Rich and Tom flew tighter courses than I was able to, and this supposition translates to even lower airspeeds than Tortoise's. My guess is that they were doing about 170mph. Thus, if a standard pylon racer is to beat Tortoise's record, it will take a better pilot than I was in 1984, and I was no slouch back when I had good eyes! A more fruitful approach would be to fit a pylon racer with a Screaming .60 and tuned pipe in place of the .40, although a .60 engine might exceed the FAI's maximum allowable wing loading of 24.5 ounces per square foot. You'd have to add wing area, and then the plane would too big to go fast. The secret to speed is a small plane with gobs of power. A delta is a good bet if you can accurately steer it. The 1984 vintage Kraft servos were too slow for the delta in the photo, but this shouldn't be a problem now.

I categorically ignore the 213mph straight-line speed record set in 1971 by Goukouné and Myakine of the Soviet Union. That record was set under time-measuring rules that were precise to only 10 percent. A disparity of 0.2 second in the timers' clocks was allowed, and the time interval was 2.09 seconds for the 200m course. In addition to this inherent imprecision, the crude timing

*Continued on previous page*